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WATER PURIFICATION HYGIENICALLY CONSIDERED.

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A FEW years ago the author, in various articles giving the results of experimental investigations on some of the subjects touched upon in these pages, felt bound to offer considerable evidence to prove that pure water is necessary to health, and that thousands of lives are yearly lost because of impure water.[1] Many epidemics due to a bad water supply have been reported at more or less length in the medical journals and in the daily papers, which reach all classes. Thousands or even hundreds of thousands of deaths from cholera have occurred in Asia, in the Orient, in Egypt, and in Europe. The recent epidemic in Hamburg (1892) is still vividly impressed upon the minds of those who give any thought to the question of water-borne diseases.

Fortunately the broad oceans safeguard us to a large extent against cholera and other Asiatic plagues; but here, as well as elsewhere, typhoid fever, not to speak of various lesser diarrheal disorders which are likewise communicated by impure drinking-waters, yearly causes thousands of deaths and many more cases of disease of varying degrees of severity. Even malaria is regarded by numerous intelligent physicians and other acute observers as presumably a water-borne disease, although the evidence offered does not suffice to prove that contention. Yet typhoid fever alone is a sufficiently grave peril to warrant an immense amount of agitation and the expenditure of many millions of money to prevent its occurrence. It is very well known that when the water-supply of any isolated household or of any community is naturally pure or adequately purified by artificial means, typhoid fever does not occur unless water be casually consumed from an impure source, or unless milk or other food, used in an uncooked condition, have come in contact with infected water, or unless the victims have acquired the disease directly from someone suffering from it. For all industrial and domestic purposes it is desirable that water be as pure as possible. Whether for "feeding" a boiler or quenching thirst, for watering the streets or cleansing a wound, the purest water is the most satisfactory. The enlightened economist and the sanitarian insist upon this, and, even if space permitted, a citation of the volumes of facts and figures available to prove it would not be necessary for those familiar with the rudiments of modern sanitation.

What then is pure water, hygienically speaking? Briefly, it may be said to be clear, palatable, free from bacteria in large numbers, and wholly free from bacteria which can cause disease; it must contain no lead or other poisons, and have only a permissibly small amount of mineral salts. The salts of lime and magnesia, in a supply for general industrial and domestic use, must not be much in excess of 15 parts in 100,000 of water, otherwise it is too hard. The water of the best lakes and rivers may be less than one-half or even one-fourth as "hard" as this. It should be mentioned that the salts present in the water which we drink do not count for much in the total amount needed daily by the human body (nearly two ounces of salts being required), as that amount is abundantly supplied by a mixed diet. The daily amount of water swallowed by a healthy man averages about a gallon. This quantity of good natural water usually does not contain more than ten grains of salts, and a mineral water having one hundred grains of salts to the gallon is altogether too strong for large amounts of it to be tolerated. A slight proportion of lime is hygienically desirable in water-supplies, for it restricts the tendency of the water to act upon metals. A very soft water more readily takes up lead, for instance, from lead pipes in which it is conveyed. A very soft moorland water, especially if acid and well oxygenated, is more apt to cause lead-poisoning to develop than is the case with limy waters.

Clearness, to the uninstructed, seems to be the most important quality of a water, and yet the clearest water, particularly that of wells, often causes typhoid fever, for the causative bacteria of that disease are not detectable by the senses when they have been introduced into a supply. On the other hand, turbidity is not usually due to a dangerous cause, however unpleasant it may appear to the eye. Water may be perfectly wholesome, and yet so colored by harmless vegetable matter as to arouse distrust among those unfamiliar with it. Chemic tests of water are of most importance nowadays as aiding one to determine its mineral constituents. In studying a pro-

[1] During the last few years there has been furnished so much statistic and other testimony to this effect that it would require too much space to reproduce it here.

posed new supply, especially if it be from a peaty source, it is well to know its degree of solvent action upon lead, for it is quite expensive to construct and maintain the plant needed for counteracting such a tendency, by filtration through lime or by the suitable addition of lime or soda carbonates. Of the organic constituents, an undue quantity (more than .015 in 100,000 parts) of albuminoid ammonia is the important practical factor which aids us to determine whether a water is bad or not. Wanklyn, in his latest work on "Water Analysis," does not attach much importance to the presence of nitrates, although they are usually regarded as evidence against the purity of a water. The elaborate organic chemic testing of a sample of water is not of nearly as much hygienic value as a careful local inspection by a skilled hydrologist of the sources whence the water comes and a critical searching for possibilities of present or future contamination.

Chemistry, then, being an inadequate guide, except as regards the presence of metals and salts, can any degree of reliance be placed upon the revelations of the microscope as to whether a water contains or is likely to contain matters or organisms prejudicial to health? Not to any sufficient extent. Of course, if tapeworm eggs or partially digested meat fibers be detected in a sample of water, it evidently is polluted, and must be condemned; but it is hardly probable that such things, even if present, will be found to have come into the exceedingly small field of a microscope. Nor does the recognition of protozoa in water aid us hygienically, according to Neisser, who has made a special study of this subject. While a water rich in organic matter is likely to contain many micro-organisms, it may not have many protozoa. On the other hand, both bacteria and protozoa can thrive in water that is very pure indeed. Wash-water, sewage, privy-vaults, and manure-heaps are rather lacking in protozoa, although affording most unwholesome contaminations of drinking-water. Every leaf or blade of grass that falls into a well introduces more protozoa (*monadines*, *amebæ*, *ciliata*) than would human feces. Protozoa abound in hydrant water at all seasons.

During the last fifteen years an incontrovertible mass of evidence has accumulated to prove that when drinking-water causes cholera, typhoid fever, and other diseases it is because of the presence in the water of the bacteria peculiar to that disease. While heretofore none of the various methods in use have enabled us to always recognize with certainty the disease-producing bacteria which are present among the numerous microbes of harmless character always to be found in ordinary water, it seems as though we are on the threshold of important discoveries in this direction. Even the familiar gelatin-culture method is of considerable value in the service of an expert, although local inspection is always of paramount importance.

The usual way to make the gelatin test is to add some of the water to strong, specially prepared, sterile bouillon made solid by the addition of gelatin, as explained in THE MEDICAL NEWS by the writer (April 27, 1889). This is done carefully after the gelatin is softened by gentle heat. Then the gelatin is allowed to "set," and in two days, more or less, the isolated bacteria of the original drop or more of water added, being diffused evenly throughout the mass of nutrient gelatin, will have increased enormously in that favorable medium. Accordingly, each separate one of the bacteria ($\frac{1}{10000}$ of an inch in size), although of itself visible only by the aid of high powers of the microscope, has, by multiplying to millions, formed a visible dot, cup, or other peculiar appearance separate from the others.

Without taking the necessary space to explain the many details of bacteriologic work which do not bear directly upon the subject of this paper, it may be briefly stated that, after years of discussion of the value of the mere counting of the number of bacteria present in a cubic centimeter of a carefully taken fresh sample of water, as a rule a water which has few bacteria is better than one which has many. The best waters have usually less than one hundred bacteria in each cubic centimeter (nearly one-fourth of a teaspoonful). Yet a large number of the organisms should not necessarily be considered as indicating that the water is unfit for use; and, on the other hand, disease bacteria entering a water which normally has few bacteria may produce serious infection. Of course, the species of bacteria present must be considered in forming an opinion. Elsner's method, consisting in using "potato gelatin" containing one per cent. of iodid of potash, promises to aid materially in the recognition of typhoid germs in water. For testing the efficacy of filters or other means of rendering an infected water fit to drink, the gelatin-culture test is all-important. It is the bacteria in such a water that the sanitarian regards as the element of danger. If the process removes all of these, it effectually purifies the water; and if it removes or destroys all but a minute proportion of these micro-organisms, it is safe to assume that practically all of the disease-producing germs, if any were present, have been removed. That the water produced is clear or palatable is, of course, readily determined by the senses.

In testing a filter in operation, the original water is examined from time to time by collecting average samples in heat-sterilized bottles. A cubic centi-

meter, or half as much, of a sample is taken in a sterile glass pipette and added to a cotton-plugged test-tube containing ten cubic centimeters of nutrient gelatin which has been softened by gentle warmth. After these are commingled the gelatin is poured upon a cool plate of sterile glass or a flat glass dish, and this is then promptly covered and labeled. Another test-tube of gelatin is treated in the same way, but is plugged with its sterile cotton as soon as the water is added. After mixing this in by gentle agitation, it is marked and laid upon its side so that the fluid gelatin and water reaches almost up to the cotton. Frequent samples of the filtered water are taken with care to prevent the entrance of bacteria from without. These are plated and tubed in the way just indicated, and all the plates and tubes are then kept away from dust and strong light, under identical conditions of free air, light, and moisture. Those in which the water introduced was sterile will show the gelatin unchanged even after a week, while those into which bacteria entered with the water will show a varying number of colonies corresponding to the number of bacteria entering. Usually those from filter-samples are of fewer varieties, even if—as in the case of low-grade or badly cared-for filters—greater in number than with the same amount of water from the raw supply.

Natural purification by slow flow through many feet of fine, porous earth produces water absolutely free from harmful or other bacteria which may have been in the water or on the surface where it fell. The majority of investigators find that, while bacteria abound on and very near the surface, they are greatly lessened a yard beneath the surface of the ground, and five or six feet deeper, in fine soil, none of these have penetrated. Accordingly, such ground-water, whether issuing as uncontaminated natural springs, or even obtained by properly constructed and protected wells, is very pure as regards bacteria, although it may have taken up a considerable amount of mineral matter. Water evaporated from oceans, lakes, and the top of the ground, and precipitated as rain, is then, like distilled water, very soft and pure, although that which first falls takes up some impurities from the air, especially near cities and from the roofs from which it is collected. In very many examinations made in various parts of this country the author, like others, has regularly found that brooklets in unsettled regions have very few bacteria, and that larger streams and lakes supplied by springs and rainfall from watersheds which are uninhabited and untilled have, as a rule, few bacteria. But as human habitations and industries increase, the number of bacteria present also increases, and a river in an agricultural valley, even without sewage entering the stream, has many more bacteria than a similar one in an uncultivated district under the same conditions of rainfall.

Communities which derive an abundant supply from the best of such upland sources, and which can preserve the watershed free from all permanent or temporary human contamination, have an ideal water-supply. Unfortunately, such pure supplies are altogether too few and do not increase, while the demand for water increases constantly, and must be met. Furthermore, supplies which were originally pure become contaminated. Thus, the necessity arises of purifying an inferior water so as to make it healthful and yet have an abundance for domestic and industrial purposes. The masses cannot or will not afford the outlay and trouble involved in using bottled waters when the public supply is bad. Neither is it found practicable to have a separate system of hydrants and pipes for a scanty pure supply when the main supply is unfit to drink.

If a water be regularly turbid and contains visible dirt, a general outcry for some process of treatment is much more likely to arise than when it is clear and palatable, yet containing the germs of infectious diseases. It is in the latter case that sanitarians find fault with the water. When turbid and colored with dirt and vegetable matter, there will occur numerous complaints from the users. If inspection of the watershed and the evidence of skilful bacteriologic examinations make it seem likely that dangerous contamination exists and cannot be checked or prevented in the future, then it is well to have recourse to filtration on a large scale. This renders the water more agreeable to the eye and the palate, while the process properly carried out removes nearly all the bacteria.

It is not easy to determine just how much dangerous contamination may be tolerated in a water without manifesting itself in the form of disease and death among those using the unpurified raw water. When a supply is condemned because obviously contaminated, the argument may be brought forward that the germs of cholera, typhoid, and other diseases tend to die out soon after entering a stream or body of water, and that that water purifies itself. It is true that something of the sort takes place. The writer studied this question [1] and found that dilution and sedimentation, the influence of light and oxygen (of the air), and also the antagonistic action of volatile acids in some river, and of the hardy water-bacteria present in all waters, especially in impure ones, contribute to the purification after contamination by the entrance of harmful bacteria with sewage or other filth. Yet if Elsner's test is employed, it is found

[1] *Trans. Amer. Soc. of Civ. Eng.*, February, 1891, and *American Journal of the Medical Sciences*, December, 1890.

that typhoid germs survive much longer and are much more prevalent than was formerly thought.[1] Accordingly, and in view of the seemingly small amount of infection causing some very serious epidemics, it is wisest in case of doubt to regard all filth contamination of water as dangerous. It is not safe to assert that all rivers of this country can "purify themselves" within twelve miles, as is often stated. Each case must be considered by itself, and judged independently. Yet it is difficult to convince municipal authorities of this necessity for pure water, and some of our cities have water supplies which may be classed as dilute sewage. As a consequence, thousands of cases of typhoid fever result among those drinking such impure water, and the disease is much more common among us than in the well-managed cities of Europe.

Recognizing to a certain extent the possible danger in drinking impure water, but also being influenced chiefly by its unpalatability or unpleasant appearance, intelligent people try to do something individually to purify the small amount used by their households. Straining the water through clean flannel or other dense substance, they find it clearer. If boiled, in addition, it is also free from any element of danger to those who drink it. And yet, prepared in this way, it has an unpleasant taste for one not used to it. This is because the two per cent., or less, of air in the natural water has been driven off by the boiling. If we restore this by forcing air through it by a bellows or by pouring the water several times from one pitcher to another, the taste is improved. The addition of a little cold tea, lemon juice, seltzer water, or other chosen savor, disguises the taste. But boiling, though the most generally available and reliable means of artificially purifying water, requires effort, especially when bottles or similar containers are used for holding the sterilized water, since they have to be kept clean. If the water be cooked in the bottles, this involves some breakage. When, therefore, a housekeeper is offered "pure drinking-water guaranteed," for an outlay of 17 cents, which purchases a "self-cleaning water-filter" which has embossed in large letters upon its nickeled metal case the pretentious words, "germ-proof filter," the temptation is strong to employ such a means of improving the domestic supply. These quoted words are from the printed advertisement of one of the large department-stores of this city. The filter, unfortunately, does not purify the water as claimed, although it strains out coarse dirt and makes dirty water somewhat clearer. It is as valuable as any of the ordinary filters, and is perhaps least likely of all of these to become a source of infection by serving as a breeding-ground for bacteria. It is filled with crushed quartz held in place by two wire screens. Screwed upon a faucet, when clean, it allows a considerable flow of water. Soon, however, the flow is obstructed by the accumulated dirt. If then, such a filter be reversed and the other end be screwed upon the faucet, the coarser dirt is washed out and also much of the finer. Yet considerable fine dirt and, among other things, many bacteria remain attached to the sand. Boiling kills these, but if this be omitted, and the filter allowed to remain unused for some hours, as over night, at ordinary room temperatures, the adherent bacteria will have increased by multiplication in the organic matter present. Accordingly, the first flow of water from the faucet after such disuse of the filter will contain many more bacteria if it flow through the filter than if the filter were not used. The number lessens gradually as the water continues running.

This serves as a type of all ordinary domestic filters, in which class is included for brevity all, whether straining water from a faucet or from a jar, or other receptacle under gentle pressure, and in which the straining substance is not very dense. In THE MEDICAL NEWS for April 27, 1889, the writer reported the results of prolonged experiments upon very many filters made of the various substances used for the purpose, and since that time he has tested every kind on the market. Nearly every permeable substance has been called into requisition by inventors in this line, such as cotton felt, wood felt, wood pulp, wood, cloth, sponge paper, chaff, wire gauze, charcoal, carbon, polarite, spongy iron, porous porcelain, porous stone, and mineral substances of varying composition in a natural or prepared state, asbestos, and simple sand. As a rule, these are the products of wholly untrained minds quite unfamiliar with the principles underlying successful filtration. Now and then there comes a new variation upon, or an independent application, of some previous idea. The study above indicated, showed that except in so far as it is intended to be a mere strainer of more or less of the visible dirt, the essential virtue of a filtering substance is fineness of structure such as will hold back all bacteria under ordinary conditions of usage for a day or more. If not of such dense material, it is merely of service as a strainer through which bacteria can pass, however well the water is cleared up, and in which they can increase to such an extent that the water flowing from them has more bacteria than that which they are supposed to purify.

This element of bacterial contamination from the filter itself varies with the kind used, and of course disappears for a brief time after the filter is sterilized,

[1] *New York Medical Journal*, April 10, 1897.

as by boiling. Accordingly, such imperfect filters should be simple in construction, commodious, easy to cleanse, and not destructible by frequent boiling. As to their capacity for holding back bacteria, that varies with the density of the filtering substance and its strength and durability. If it tears readily and allows holes or fissures to form, bacteria can of course pass through such breaches of continuity. The simplest and most permeable kind—the sand filter or, rather, strainer above described—holds back so few bacteria as to be practically worthless in this respect. A dense, freshly sterilized flannel bag upon a faucet or a folded filter paper (or even a plug of absorbent cotton) in a funnel does rather better work. Carbon blocks and wood pulp hold back a considerably larger percentage, but allow disease bacteria to pass through and also to increase in the porous filtering mass. Porous stone is still more efficient and when of the finest quality will hold back larger and medium-sized bacteria, such as the germs of cholera and typhoid fever, for many hours. It renders some turbid, silty waters very clear. While the best of these, frequently sterilized by chemicals or by boiling, can be employed by an expert with safety, they are not to be recommended for ordinary use in time of epidemics or when the water filtered is regularly infected, unless it has always been cleaned and boiled a few hours after it has first been used after a previous boiling. This is a requirement which the masses will not observe. So long as a filter renders water clearer, they allow it to strain their drinking-water, regardless of the possibility of bacteria passing through. Asbestos, in carefully arranged sheets, is employed for filters, some of which display great mechanical excellence. This can be made to yield better results than any ordinary filter, although inferior to the best; but the weakness of the tissue, the bulkiness or complexity of the efficient filters of this substance, and the difficulty of cleansing them, militate against their adoption, although some may be sterilized by baking. Porous porcelain of coarse texture, such as is used in electric-battery cups, is much like porous stone, holding back bacteria for a brief time, but is quite inferior to finely porous porcelain as used in the most efficient filters.

These second-rate substances are bacterially efficient, in proportion to the minuteness of their largest pores and in inverse ratio to the pressure with which the water is supplied. The densest offer the greatest resistance to bacteria and also to water. A corollary of this is the fact that a thoroughly efficient filter cannot be very rapid, and when a given filter yields water much more rapidly than another having the same surface exposed to the crude water, the former is less capable of separating bacteria. Both being under the same conditions, the less rapid yields water freer of germs than the other. And yet the slowest filters are not necessarily in all cases the most efficient, as when, for instance, the slowness is due to a thick mass of fibers or granules which cannot altogether prevent bacteria from getting through, and which, in consequence, must allow them to increase prodigiously in the dirty mass. In no case is slowness a merit, but, because of exhausting the patience of those who use a filter, is to be lessened as much as is consistent with practical retention of "germ-proof" quality.

The only filtering substances which can safely be recommended for household or other use on a small scale, is (1) fine, dense, porous porcelain of standard make and uniform quality tested by the maker; and (2) the prepared infusorial earth cylinders which carry the trade name of Berkefeld. The latter remain germ-proof for a shorter time than the best of the former class—of which the "Pasteur" filter cylinders may be taken as a type (Fig. 1), yet they

FIG. 1.

Pasteur-Chamberland filter tubes. Portion of wall of upper one removed.

are within the limit of safety if cleaned and sterilized (by boiling) daily. They have the great merit of comparatively rapid flow, and are less likely to become broken than the French tubes. Both of the two specified are expensive, being patented articles of foreign manufacture. There are several patterns of filters using excellent porcelain material but made in this country at Trenton and elsewhere. Specimens tested by the writer were quite as good in germ-proof quality and flow as the material of the Pasteur filters. This he has proved by the most rigorous tests carried on in one instance for eight weeks of unintermitting flow, during which time no bacteria came through.

The "Pasteur" filter is also, and more properly, designated by the name of Chamberland, who first exploited this valuable material, taking out a Belgian patent (No. 69,095) for the exclusive right of using rebaked porous porcelain for filtration. A German patent, antedating this, and a French one dated eighteen months later, might be interpreted as indicating that Chamberland attached importance to the principle of filling with charcoal the space within the metallic casing outside of the porous cylinder. This idea was not utilized by the producers, although in a less popular competitor (Mallié filter, patented in

February, 1895) are used flat plates of similar porous porcelain outside of which are corresponding plates of carbon to intercept dirt and prevent speedy clogging of the porcelain by turbid water. Before knowing of Mr. Chamberland's idea, the writer had suggested the same expedient for use with muddy water.

For the Chamberland-Pasteur tubes, semivitrified porcelain is ground up and used in the preparation of the finest product, to give greater porosity. Finely ground silica answers the same purpose, yet if any but the smallest sand-grains are used, it is considered by the makers that the resistance to bacteria is likely to prove insufficient. Some of the best porous porcelain produced in this country seems to be composed of from fifty-five to seventy per cent. of finely ground silex, with between forty-five and seventy per cent. of kaolin clay. This porcelain is quite inexpensive, fairly durable, and as germ-proof as the best French product. The German patent, No. 19,589 (January, 1882), covers the preparation of a similar porous filtering material, as is also the case with the English patents of Bagshaw (1834), Roberts (1859), and Joseph (1870). Yet it is doubtful whether the products were fine enough to be germ-proof. It was not until 1871 that it was definitely recognized that porous porcelain of the proper sort could remove all bacteria from liquids. This was discovered and utilized by Tiegel, a Swiss pupil of Klebs. About the same time Zahn employed clay cells for the same purpose. In the same way Hiller (1874 or earlier), Panum, and others, as well as Sanderson (1878), utilized porous porcelain. In France, Arloing, Toussaint, and others achieved the same result as Tiegel by using plaster with or without the admixture of asbestos for strengthening the texture. Pasteur, in 1877, used this also, abandoning it later for rebaked porcelain. The admirably adapted cylinder shape still used in the Pasteur filter is due to Chamberland, although somewhat similar patterns had been illustrated in publications previous to his time. The efficacy of rebaked porcelain was announced by him in 1884, through Bouley.[1] While formerly made of two degrees of porosity, the output sold here is now of only one uniform density.

This substance, thus gradually evolved, has never been improved upon as regards permanency of germ-proof quality. A perfect cylinder will remain impermeable to bacteria for days and even weeks, allowing water to flow through in a slow stream or in drops, until the silt and other things carried by the crude water choke up the interstices on the surface. This extreme slowness, increasing with use, is a serious drawback, which, like the brittleness, renders it less popular than its admirable filtering property would otherwise make it. A cracked or flawy cylinder should be discarded, like a broken one. The frequency of mishaps with ordinary careless handling and cooking for the purpose of sterilizing make the Pasteur filter too expensive for the masses, since a new cylinder is retailed for three or more times as much here as in France. There the writer has bought them for about thirty cents. A cylinder which has deteriorated by weeks or months of use, but which is not cracked, can be renovated; yet the ordinary cook cannot be trusted to do this. Careful baking of cleaned and dried cylinders at the high temperature of nearly 300° C. (572° F.) will make the porcelain nearly as efficient as when new. This heat, of course, completely sterilizes the cylinders at the same time. They should be allowed to cool gradually. Another method is to use chemicals. The tubes are well cleaned and then inverted to drain out for fifteen minutes or more. Then, outlet upward, they are filled with, and soaked for at least fifteen minutes in, a twenty-per-cent. lukewarm solution of pure chlorid of lime (or Labarraque's solution or *eau de Javelle* with twice its volume of water). Thereby the albuminoid and mineral deposits in the pores are disorganized. Next they are emptied and then filled with, and lie for another quarter of an hour in, hydrochloric acid diluted with four or five times its volume of water. After this they are emptied and rinsed with boiled water. Another means of sterilizing and regenerating them is to employ similarly, and for twice as long a time, a 1–150 solution of permanganate of potash, followed by a five-per-cent. solution of bisulphite of soda. Very dilute hydrochloric acid tends to prevent the deposition of manganic bioxid in the pores. To detect flaws or other imperfections, the manufacturers of good porcelain filters moisten the substance and then apply air-pressure of at least seven pounds. Those which allow air to pass are rejected. The test is very easy for any one to make by means of a small air-pump.

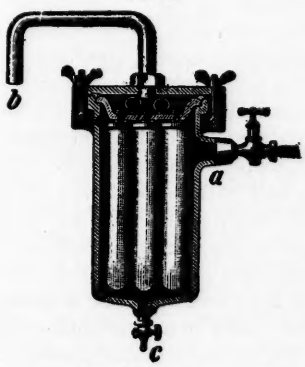
After a few days, or at any rate a week of use, such a filter-cylinder needs to be removed, brushed off, and rinsed. Then it should be boiled gently for half an hour and allowed to cool gradually before replacing in its casing. This is because not even the best filter-substance is germ-proof for an indefinite length of time. Until nearly a decade ago they were regarded as absolutely germ-proof, and even later than that some observers, presumably after inadequate tests, have said that these porous porcelain surfaces allowed no bacteria to get through. In 1888, by a series of thorough tests and checks thereon, made at the Carnegie Laboratory in New York, the author found that, even when the filters were kept cool and when only cold water was used,

[1] *Comptes Rendus. Acad. des Sciences*, August 4, p. 247.

bacteria passed through soon after the end of the second week of constant usage; so that in time many more were in the filtered than in the unfiltered water. Pasteur cylinders used for the purpose were of the pattern sold at present, and of the best quality, having been purchased by the writer in Paris, of the principal agency, and represented by the seller as perfect. The results of those experiments were accepted, and have since been confirmed by other investigators. Disease-bacteria can grow through this substance in laboratory experiments where everything is arranged to favor the growth; but it has not yet been shown that this can occur under ordinary household conditions of usage of tightly fixed, perfect cylinders washed and sterilized by boiling at least once every week.

These filters possess, then, a high degree of efficiency as regards the removal of bacteria, and whatever has been said above regarding the efficacy of

FIG. 2.



Battery of filters of the Berkefeld pattern. *a*, inflow; *b*, outflow.

one well-known pattern applies equally to all filters properly constructed of the best porous porcelain. As already stated, American porcelain stands the severest bacteriologic test as well as does the imported material. There seems no inherent reason why all of these should not be fairly good if only made with proper care. It must be borne in mind, however, that when of small surface they cannot be rapid and at the same time germ-proof for any considerable length of time.

When "batteries" are arranged by connecting a few or many of the separate porcelain tubes, of the Pasteur type, or of similar styles, to an outflow pipe by very tight joints, correspondingly increased quantities of pure drinking-water can be obtained from them. These multiple arrangements do not prove quite so "germ-proof" as the simple tubes securely fixed each in its separate metal casing, yet in an institution where a physician, or other person, trained in simple bacterial methods, constantly supervises the arrangement, the cleansing and necessary renewals, and also regularly tests the yield, very bad water can be rendered wholesome by such means. This is proved from the reports of the French Minister of War, based on the prolonged and systematic use of these filters in French garrisons, resulting in a reduction of the typhoid death-rate from one to ten per cent. of what it formerly was, and the cases occurring are said to be nearly always explainable by the use of the ordinary or some outside supply in an unfiltered state. As a point in favor of these and against inferior filters, it is stated that in the British army in India, where charcoal and sand-filters have been used, the number of deaths from typhoid fever has steadily increased since 1884. Such filters are worse than none. Outside of garrisons, military use of porcelain filters proves, with or without the André cleaner and infusorial earth powder, to be unsatifactory, notably in campaigns where the foulness and pestilential quality of the only waters obtainable make an adequate purifier absolutely necessary. However brilliant the laboratory and exposition results, the military filters failed under the conditions of practical usage. Barthélémy, and also Molinier,[1] very forcibly pictured the inadequacy of these. The best pattern among military filters is called "*filter de campagne*," has fifteen filtering cylinders, and weighs 110 pounds or more.

For use in households where no hydrant water or other piped supply exists, yet where filtration of the drinking water seems necessary, the writer would suggest that some manufacturer introduce circular plates of this germ-proof porous porcelain, perhaps slightly convex on the lower surface, in order that the water might drop only from the center of the plate. This could be held to the necessary cylinder or section of pipe above, and to which it will form a bottom, by screw-clamps pressing it tightly against an intervening rubber ring on the periphery. Although such a plate would filter very slowly, it could be very easily cleaned and boiled. Porous stone of similar pattern is used, but is unsatisfactory, not being germ-proof, although it clears turbid water. Being cemented into the lower rim of the jar above, it cannot well be sterilized. There are various patterns of non-pressure filter metal jars using several porcelain tubes inserted in holes in the bottom. Siphoning arrangements may also be employed. The yield is often contaminated.

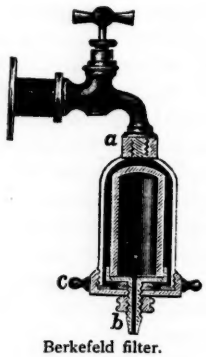
The porcelain tube-filters, as also those of the material about to be mentioned, may be used with a union-joint or two-way water-cock. The cumbrously long Pasteur filter is thus rendered more convenient for ordinary sinks, yet the writer prefers the older

[1] *Archives de Médécine, Navale et Coloniale*, 1893 and 1894.

patterns in which the water flows directly downward out of the porcelain cylinder into jars or other receptacles, even though that necessitates a special faucet reserved for the use of this filter. In the case of a specially introduced piping the water should come through iron instead of lead, or a block-tin pipe could be used at twice the price of lead pipe.

A successful rival to the above filter is presented by the (Nordtmeyer) Berkefeld pattern which is similar in shape and mechanism, but which is many times faster, yielding when clean and freshly boiled nearly a quart of germ-free water in a minute from the smallest domestic model. The porous filtering cylinder is only three inches in length. Closed, like the porcelain cylinders, at one end, the open end is firmly cemented into a flattened, metal funnel having a small central outflow tube, by the outside of which it is screwed tightly inside its metal casing. (See Fig. 3.) No breakable part is exposed when the filter is attached to a faucet. The household pattern, illustrated here, is so compact that it can be attached to a kitchen faucet and yet allow a jar or pitcher to be placed beneath to catch the filtered water. Its comparatively rapid yield is due to its extreme porosity. The short porous cylinders or cups have walls more than half an inch thick, and are composed chiefly of infusorial earth appearing under the microscope as compressed diatoms (fossil bone-meal) held together by a secret process. They cost $1.50 each, and are more durable than porcelain. The general rule above given, that with increased yield the germ-proof quality is lessened, holds good with these as with other filters, yet they hold back bacteria long enough to render them safe if sterilized by boiling every day or two. The writer, who has tested a number of these during the past two years, has not found one that could not hold back all bacteria for one day. In some experiments, under various conditions of practical usage and with a pressure as high as thirty-eight pounds, when the filters were kept cool (10°-12° C.) during an intermittent yield of more than five gallons daily, they produced sterile water until the eighth day.

FIG. 3.



Berkefeld filter.

From the results of many tests, it may be stated briefly that the Berkefeld filter will hold back all bacteria from one to three days. We can safely recommend them, therefore, even for use with infected waters, on the condition that the porous filtering cup be taken out daily, and cleaned and then sterilized by boiling for half an hour. The water should not be very warm when they are put into the clean vessel in which they are to be boiled and should be allowed to cool enough to be endurable by the hand when they are taken out. When greatly thinned by repeated brushing or whenever a flaw develops in a porous cup, it should be discarded. It is advisable to have an extra tube on hand, although a single tube can be used for many months. The filtering substance lasts longest if not brushed roughly, but rather cleansed by means of pieces of cloth under a flow of water upon the cup. They do not break by gentle boiling, with little or no ebullition, even if for convenience they be thus sterilized in the same clean vessel in which other things—such as nursing-bottles—are cooked; yet rough handling breaks them. As with porcelain tubes of different makes, when the water is not supplied under pressure, these can be arranged to work with various forms of portable or fixed pumps, singly or in batteries. A single tube thus arranged weighs, with pump and portable stand, eleven pounds, and yields a gallon in two minutes. At least one extra tube should be at hand and also a vessel for the daily boiling, which must not be omitted. For bottling establishments and other users of large amounts of clear waters, batteries of these tubes are successfully used. One of fifteen tubes freshly cleaned and boiled yields seven gallons of sterile water per minute under a hydrant pressure of forty pounds. Testing such a filter under a lower pressure (East 42d St., New York), the writer found the water quite free from bacteria, the very few that were present probably coming from the unsterilized hose pipe used for conducting the outflow. The water was as pure as that from any mechanical filter which the writer has examined. Yet stress must always be laid upon the importance of frequent boiling of such tubes. Reliance must not be put upon the employment of automatic means of cleansing them by the use of powdered infusorial earth to the neglect of boiling several times a week, although bottlers are apt to disregard such injunctions. In a carefully managed hospital or institution under proper scientific medical control these battery filters can produce water entirely free from germs.

All things considered, the simple form of the

short-cylindered Berkefeld filter is to be recommended as the best for household use when there is a hydrant supply needing filtration, but it must be repeatedly emphasized that frequent boiling of the porous cup is essential to perfect results. While thus commending this filter, the writer would not disparage the best porcelain filters. In his own residence, both kinds are in regular use and both yield sterile, wholesome water.

As compared with the use of these germ-proof filters by the few intelligent people who will regularly give them the requisite amount of care (in itself very trivial, but yet indispensable) any other filtration of drinking-water is inferior. Even the best gravity-filters are not perfect and yet they are in every respect better for a city than the individual use of any ordinary domestic filter; for most every pattern in the market is worse than none and vastly inferior to the employment of boiling for purifying water at the time of an epidemic.

(To be continued.)

THE TREATMENT OF ABORTION.

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The Century Dictionary says that a somewhat useless distinction has sometimes been drawn between abortion and miscarriage, by which the former is made to refer to a termination of pregnancy during the first four months, and the latter to the following three months. According to the same authority, the terms miscarriage and abortion are applicable to a premature ending of pregnancy at any time before the end of the seventh month. In my opinion this distinction is useless. If employed as a basis for therapeutic indications, it is dangerous and should be abandoned. To place a landmark at the end of the fourth month of uterogestation is probably a relic of olden times, when the theory prevailed that the fetal life did not begin until the mother became conscious of the child's movements, the so-called quickening. Many women regard it as a comparatively slight offense to take measures causing the interruption of pregnancy before the child is supposed to be viable, while possessing the idea that the same act committed at a later period is something akin to infanticide. From a physiologic standpoint, fetal life begins the moment of the junction of the male and the female elements.

Other authorities, *e. g.*, Foster's Medical Dictionary, limit the period during which abortion may occur, in a stricter sense, to three months. This is better, since it has reference to the completion of the placenta. In a general way it may be said that at the end of three months there is a well-developed placenta, but its formation is gradual, and, like most other vital processes, is to some extent subject to individual variations. Some time between the middle of the third and the middle of the fourth month, the ovum loses the chorionic villi with which it is covered at a previous period and becomes smooth, except over the area where the villi grow into the decidua, and together form the placenta. From this it follows that the treatment which will be advocated in these pages is indicated at any time, not only during the third, but even during the second month. I am, therefore, not in favor of establishing a difference between abortion and miscarriage. Both terms may be used to express an interruption of gestation at any period previous to the viability of the fetus.

In regard to the use of the terms abortion and premature labor, I do not approve of the period of seven months as a landmark to be employed in discriminating between them. Since many infants may be reared when pregnancy terminates as early as at the end of the sixth month, this is the time after which abortion is no longer possible, and indicates the natural and proper use of the terms abortion and premature labor. From the end of the fifth month of pregnancy the child may be born alive, inasmuch as its circulation is maintained independently of the maternal organism, and its muscles evidence contractility; but at this early period it is not viable. If the placenta is expelled spontaneously, or is expressed by Credé's method, as is often possible at this stage, the case should be regarded as one of premature labor, and the treatment for abortion is not indicated.

During an extensive experience in obstetrics and gynecology, I have observed a large number of abortions at every stage, and my clinical notes, which form the exclusive basis of this paper, lead me to think that abortion is most frequently observed during the third month of gestation, and with diminishing frequency during the second, fourth, and fifth months. As to the first and second months, I do not doubt that many abortions occur which do not come under medical observation, and sometimes without the knowledge of the patient. I have thus accidentally observed an abortion at the end of the second week which was entirely deprived of subjective symptoms. On the other hand, I have seen dangerous hemorrhage coincident with abortion at the end of the first month which, without proper treatment, might have ended fatally. Many menstrual irregularities in recently married women are probably due to pregnancy and its untimely interruption.

By far the most common symptom of threatened abortion is hemorrhage from the uterus. When abor-

tion actually occurs, clots are discharged, and in some cases this is all that will be observed. In others the entire ovum, or portions of it, or even the fetus itself, is discharged. The loss of blood may be so considerable that the patient becomes faint, loses consciousness, or even dies. The hemorrhage may be protracted over days, weeks, and even months, and in such cases, even though moderate, it weakens the patient to a greater or less degree.

In most cases there is some pain, which is described as being cramp-like, and indicates painful contractions of the uterus. Backache is also a common symptom. Often there are nausea and vomiting. Among rare symptoms I have observed stiffness of the lower jaw, which means a beginning tetanus.

On vaginal examination the uterus will be found changed in size, consistency, and shape, according to the stage of pregnancy reached before the occurrence of abortion. As a rule, the os is more or less patulous, sometimes to a degree sufficient to admit a finger. Often the ovum may be felt projecting from the os, or if the fetus has been expelled the torn umbilical cord may be found. In other cases the os is closed. If the fetus is macerated, offensive purulent discharge may be observed to come from the interior of the uterus. If general septicemia has developed the pulse will be small and rapid, and sometimes the temperature will be elevated. Under such circumstances there may be present weakness, nausea, vomiting, and a yellowish color of the face. In such a case I have seen repeated epistaxis and the development of a retro-uterine hematocele, which finally led to a fatal termination.

At the normal end of pregnancy, and even in premature labor, the ovum separates from the uterine wall, leaving only a layer of cells which serve for the reproduction of the endometrium, and therefore interference is not usually indicated. I do not even employ an intra-uterine or vaginal injection. On Braune's[1] beautiful plate representing a section of the frozen body of a woman at the end of the eighth week of pregnancy, the decidua in the lower part of the uterine cavity is a centimeter in thickness, and its cut surface is twice as thick as that of the chorion. Usually the decidua vera is the last portion of the products of conception that is expelled, and the process of discharge may require weeks or even months before it is complete, the uterine contractions being too weak to expel what is now a foreign body; it must remain until disintegrated and removed in small shreds as a constituent of the lochial discharge. During this time the patient is exposed to the dangers of hemorrhage and septicemia.

[1] Wilhelm Braune, "Topographisch anatomischer Atlas," Leipzig, 1875; plate No. II.

In very early pregnancy the entire ovum may be expelled at once, and the remaining decidua be so insignificant that it will take care of itself. At best the reflexa may be discharged with the ovum, the vera remaining. In the plate above mentioned may be seen an accumulation of blood between the chorion and the reflexa. During abortion the blood, by increasing in quantity, will gradually separate the ovum from the reflexa, and the former may be expelled, leaving both the vera and torn reflexa behind. Sometimes there may be a fetus in the discharged products; in other cases we find only a deformed mass, even when the ovum is expelled entire. Again, in other instances, only the fetus will be thrown off, and the remaining conception products remain in the uterus.

The prognosis in any case of abortion is doubtful. If rational treatment has been instituted, the prognosis is good. I have never observed a fatal termination when I have been able to direct the treatment from the beginning. If left to itself or improperly treated, abortion is a dangerous accident which often ends fatally, usually from the occurrence of hemorrhage or septicemia. More women die from abortion than from childbirth, even if the bungling operations of professional abortionists are not considered.

The treatment may be prophylactic or curative. The former is especially called for in cases of habitual abortion, in which a history of syphilis is so frequently elicited, and by instituting specific treatment of the husband, the wife, or both, it may be possible for pregnancy to be completed. It may be necessary for the patient to change her occupation or location of residence, especially if the latter should be in a malarious district. Sometimes a uterine displacement exists which may be remedied before pregnancy occurs. If no such indications are found, I have sometimes succeeded in preventing abortion by having the patient remain in bed during the week corresponding to what would be a menstrual period if pregnancy had not occurred. Confinement to the bed should continue from two days before menstruation would be due under non-pregnant circumstances to five days after. At the same time a teaspoonful of fluid extract of viburnum prunifolium should be administered three times a day. During the remaining three weeks moderate exercise in the open air is indicated, and at the same time iron, quinin, red bone-marrow, arsenic, and phosphorus may be given with benefit. In my opinion, this is a better plan than forced and complete rest during the whole of pregnancy, which treatment is very weakening and may assist in the causation of abortion or make the patient less fit for the ordeal of childbirth. Coition,

dancing, horseback riding, bicycling, gymnastics, and all sorts of sports or fatiguing work must be absolutely forbidden.

If abortion threatens, as indicated by loss of blood from the uterus, it becomes necessary to decide if further prophylactic measures are advisable. Under these circumstances it is often possible to prevent abortion by means of complete rest and the administration of viburnum prunifolium, opium suppositories, a saline, and the application of an ice-bag to the hypogastrium. If hemorrhage is considerable or has continued long, if the cervical canal is open, if the ovum is felt projecting into the vagina, abortion is inevitable, and then the sooner the uterus is emptied the better it will be for the patient.

The old treatment, consisting in vaginal injections of ice-water tamponade and removal of the ovum, exposes the patient to great danger, and at best leads to a tedious recovery. I very rarely use a tamponade. The indications for its use are only when there is great weakness, necessitating a better general condition of the patient before having recourse to operative interference, and also when, on account of unfavorable surroundings, it is wise to remove the patient to a hospital.

In many (even new) books the use of tents for producing dilatation of the cervical canal is recommended. I am opposed to the employment of any kind of tent except that, if it is deemed necessary for other reasons to tampon, I use iodoform gauze in the upper part of the vagina, and introduce a portion of the gauze into the cervical canal. If immediate dilatation is necessary it is, in my opinion, much better to use either the expanding or coniform dilators. If a tampon is used, only the portion which is placed in the upper part of the vagina should be composed of iodoform gauze. The portion of the tampon in the lower part of the vagina should be made of pledgets of absorbent cotton wrung out of a one-per-cent. creolin emulsion, and should be inserted with the aid of a Sims' speculum, and so tightly packed that it effectively prevents any loss of blood.

In most cases it is my practice to dilate the cervical canal instrumentally. For abortion occurring during the first three months of pregnancy, all that is required for this purpose is a set of conical, hard-rubber dilators, or a dilator embodying the principle of a glove-stretcher. During the fourth and fifth months a higher degree of dilatation is required, and for this purpose I employ a set of olive-shaped hard-rubber dilators. The set consists of ten olives, ranging in circumference from 33 to 68 mm. At a later date of pregnancy Hanks' large dilators, ranging from 73 to 137 mm., are very useful. When the necessary degree of dilatation has been effected, the uterine cavity may be emptied. Much less violence is required in introducing dilators than in forcing a finger through a closed os, as has been recommended.

For the purpose of emptying the uterus, Thomas' small dull wire-curette is useless, and may lead the operator into an erroneous belief that the cavity is empty. On the other hand, his large dull wire curette, with an opening admitting the tip of a forefinger, is an admirable instrument for the purpose of both loosening the ovum from the walls of the uterus and removing it by seizing it between the instrument and the index-finger, as well as for scraping off the decidua vera. Formidable as the instrument appears, I have used it many times with the greatest satisfaction. Before the end of the second month of pregnancy it is too bulky, and in such cases I employ the old Récamier curette, which also is dull, but much smaller and better adapted for this period. At a very early stage, say at the end of the first month, it is even necessary to use Simon's sharp spoon or Sims' curette. For the removal of the fetus, a blunt forceps with heart-shaped or oval rings is required, and the same instrument may, in rare cases, be necessary to assist in removing the placenta; but in nearly all cases I prefer the combined use of the finger and the large, dull, wire curette. By using moderate force one can safely scrape as long as anything comes away. When the uterus has been emptied and is small, it is only necessary to pack the vagina as described above. If it is larger, say corresponding to three-months' gestation, it is my practice to pack the uterine cavity with iodoform gauze before tamponing the vagina. The tamponade is removed the following day, and after that a vaginal douche of one-per-cent. carbolized water is given twice daily. The patient should remain in bed at least one week.

Immediately before and after curettage the uterine cavity should be flushed with two pints of a one-per-cent. creolin emulsion, which is both antiseptic and hemostatic. For this purpose I use a single-current metal tube. There is no advantage in combining the curette and irrigation-tube in one instrument. I prefer, on the contrary, to distinctly see what is scraped away. To use the finger as a curette is in most cases unsatisfactory, even when one hand is used for pressing the fundus down. The finger is often arrested at the internal os or does not reach the uppermost part of the cavity, and at all events, it can only be used to separate the ovum from the uterus, and cannot remove the decidua vera.

When the uterus is empty and the tampon has been applied, ergot may be administered to the best advantage, and it should be continued in doses of one

teaspoonful three times daily until an ounce has been taken.

Should pain be an element, which is exceptional after the uterus is empty, there is no objection to the administration of an opiate. In most cases it is certainly advisable to employ anesthesia. It is hardly necessary to say that the rules of clean midwifery should be carefully observed.

Should pregnancy be terminated after the fifth month, and the placenta not be expelled, either by the uterine contractions or by Credé's method, it is better to tampon the uterus and vagina as described before, and await further developments. If the placenta does not come away within twenty-four hours the dressing should be renewed and left in place a day longer, and then if the placenta yet remains within the uterus, its mechanical removal is positively indicated. The intra-uterine use of steam has of late been recommended, but it has been found in cases in which hysterectomy has subsequently been performed that it requires four weeks before the cauterized tissue is regenerated. Experience in other conditions in which I have used steam after curettage has shown that its use is often followed by a protracted purulent discharge. Consequently, its employment does not seem advisable.

That the treatment advocated in this paper may be used even when the os is closed, follows from its applicability to cases of induced abortion. I have had but four such cases, which were described in a paper read before the American Gynecological Society.[1] The operation was performed at the end of the first, the second, and the fourth months, and at the end of the seventh week of pregnancy. All the patients made good recoveries within a week, and at no time were seriously ill.

Our resources are limited for the treatment of septic cases, and the prognosis should be very guarded. If the fetus, ovum, or placenta are retained, or should there be hemorrhage, the cervix must be dilated and the uterus curetted and washed out. In doubtful cases it is often better to refrain from curetting, for by this operation the protective wall which Nature throws out may be destroyed, and infectious germs given a ready means of penetrating to the deeper tissues. Under all circumstances great attention must be paid to the general treatment in septic cases. The patient should be given as much whisky or brandy as she can tolerate—twelve ounces or more during the twenty-four hours. Salophen given in 5-grain doses every three hours has seemed beneficial. It is needless to say that the bowels should be kept open.

[1] "Transactions American Gynecological Society," 1895, vol. xx, p. 469.

In localized septic cases a treatment similiar to that recommended for simple abortion is indicated. In septicemia whether or not local treatment is necessary will depend upon the obtaining circumstances.

THE CONTRIBUTIONS OF BACTERIOLOGY TO THERAPEUTICS.[1]

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It is now a matter of familiar knowledge that bacteria cause disease chiefly by means of the poisons which are elaborated during their growth. The abstraction of food from the body and the mechanical interference with functions which are caused by their presence are also deleterious, but in a minor degree. Bacterial activity outside the animal organism produces fermentation or putrefaction, inside the body it produces what is termed disease.

Although many complex factors influence the degree of susceptibility of the body to infection from any pathogenic germ, the most important and perhaps all-embracing one is whether or not the animal organism at the time and place of infection is in proper condition for the growth and activity of the invading germ. The living body certainly is not a good soil for most bacteria, even after they have penetrated the outer protecting wall of skin and mucous membrane. The reasons for this are, however, only partially discovered.

While it is true, that the animal temperature and the concentration of food in the blood and tissues militates against the growth of many forms of saprophytic bacteria, on the other hand, these conditions are not unfavorable to the vital processes of most pathogenic organisms, and can hardly be thought to explain the great variation in virulence between different varieties of the same species. Thus, if a single virulent streptococcus be introduced into the tissues of a rabbit, it reproduces itself a million fold within a few hours, and the resulting septicemia proves fatal within a short time, while a million streptococci from another and less virulent culture injected at one time will die instead of developing in the body of the inoculated animal. Both these cultures will, however, grow equally well in the blood-serum after its removal from the body. Consequently, to the other factors influencing bacterial growth must be added qualities only possessed by the living tissues. This protection against infection exists in different degrees in the same individual toward different bacteria, and among different individuals toward the same bacteria.

[1] Original abstract by the author of the Wesley M. Carpenter Lecture, delivered at a meeting of the New York Academy of Medicine, October 21, 1897.

The causes of immunity, either natural or acquired, are still only partially understood. If a few virulent anthrax bacilli are injected into a susceptible animal, the results of inoculation are soon manifest, and death of the animal follows. If an animal of the same species, which has previously been immunized, be inoculated with the same germ, the bacilli not only do not increase but soon die. In seeking the reasons for this varying action of bacteria, it was found that in non-immunized animals they develop unhindered by the vital activity of the cells or fluid substances of the body, while in the immunized animals certain cells are attracted by the bacteria, and eventually destroy them. Mennes' recent investigation of the pneumococcus infections would seem to show that the attraction of the leucocytes for bacteria is not wholly due to any inherent property of the leucocytes, but rather to the effect upon the leucocytes of substances in the serum. He found that when pneumococci are added to non-immunized serum containing leucocytes from immunized blood, no phagocytic action occurs; but that when leucocytes from either immunized or non-immunized blood are added to immunized serum, they attack the bacteria. Besides this action of the cells, the blood probably possesses direct bactericidal properties. As to the nature of the action of toxic and antitoxic substances upon each other, there has been much curious speculation. The following slight modification of the theory of Knorr is presented as a working hypothesis:

It may be considered that a toxin is a substance which is directly poisonous according to the intensity of its affinity for the cells of the living body. Thus, the cells of a chicken which can tolerate enough tetanus toxin to kill thirty horses, but which can be affected by still larger doses, may be considered to have 10,000 times less attraction for the toxin than those of a horse. If we further consider that the toxin even has a stronger affinity for the antitoxin than for the cells, it may be understood how, this affinity being satisfied, the poisonous power is neutralized, and it can no longer injure the cells. An antitoxin may, in my opinion, be best conceived as a toxin which has been changed by contact with the living cell, either within the cell or outside of it. The antitoxin may have been changed by uniting with some constituent of the cell, or may have simply been acted upon by it. For the specific nature of the antitoxin it must, I believe, be considered to be a part, however little, of the toxin; for it seems improbable that the cells can produce a specific antidote for every variety of bacterial poison. Others consider that the antitoxin is secreted by the cells, the toxin simply acting as an irritant, and that the antitoxin also acts upon the cells, rendering them insusceptible to the poison. As neither toxins nor antitoxins have ever been obtained in a chemically pure state, and as an antitoxin cannot be separated from a toxin, nor differentiated from it by chemic means, we will be obliged to remain satisfied with theoretic explanations for same time to come.

An important characteristic of antitoxins is the fact that they are gradually eliminated from the blood by the urine, saliva, etc., so that after a few weeks they may have entirely disappeared. As we do not know the nature of the micro-organisms which cause smallpox, syphilis, etc., the immunity which follows their occurrence is naturally not clearly understood. Some days after the infection the blood contains immunizing substances, but they are very weak, and it is difficult to attribute to them the long duration of the immunity. However, when the long duration of the infectious period of syphilis is remembered, it is not impossible to imagine that the tissues in the other diseases in which protection is most lasting contain substances, perhaps in encysted from, which directly or indirectly cause the production of future immunity.

Bacteria differ greatly as to the particular tissues in which they can develop, and, therefore, in the manner in which they produce infection. Thus, a few tetanus bacilli are introduced by a splinter into the foot, they multiply but slightly, but find the soil suitable for the production of sufficient toxin to kill within a few days. The same bacilli introduced into the body by way of the alimentary canal, although readily developing in the intestines, find no lodgment in the mucous membrane, and are, therefore, harmless. On the other hand, the cholera spirillum introduced in the same way develops in the intestine and causes disease; carried by a splinter under the skin it is harmless. The bacillus of diphtheria requires still different conditions for its growth. It is practically harmless in the intestines, under the skin, or in the blood, but lodged on the throat or mucous membranes it causes diphtheria. Bacteria differ markedly in the rapidity with which they produce disease. Thus, the tetanus bacillus kills quickly by its toxin, while the tubercle bacillus slowly invades the tissues, and month after month destroys portions of one or more organs before finally causing death.

There are certain general factors which temporarily affect the susceptibity or resistance of the living tissues to all micro-organisms. Thus, clinically, as well as bacteriologically, it is known that lack of food, exposure to heat and cold, over-exertion, extreme youth, old age, and many other influences predispose to disease, while opposite conditions assist the body to protect itself.

In order to determine whether curative agents are produced for any individual disease, it is necessary to examine in each, by means of the toxins, or by means of living cultures, whether immunity may be produced in an animal, and whether in such an animal the blood contains at any time sufficient antitoxic, or bactericidal properties, to confer immunity when introduced into the bodies of other animals. Further, it must be decided in each individual disease what length of time may elapse from the date of the infection in which the serum or toxin will still be able to prevent the development or arrest the progress of the disease.

Tetanus antitoxin has been applied on a large scale in immunizing animals against possible infection. Thus, horses which are used for the production of antitoxic serums run a considerable risk of tetanus infection from the large number of hypodermic injections which are necessary. During 1895 the Health Department lost several very valuable animals in this way. Since then the experimental animals are immunized from time to time with 30 c.cm. of tetanus antitoxin, with the result that tetanus does not occur. The power of tetanus antitoxin to neutralize the poison before it has affected the cells is marvelous and certain, but after the cells have been injured the opposite is true. The results of treatment are not as brilliant as are those of immunization. By the time the symptoms of tetanus are manifested the cells are frequently too profoundly affected to receive any assistance from the antitoxin. The symptoms of this disease develop from one to five days after infection. Usually until the symptoms appear the animal may be saved by an injection of antitoxin, but after the appearance of the first symptoms the antitoxin is, as a rule, useless. Sometimes, however, it will save when given a few hours after the first symptoms have developed.

When the symptoms develop within six to eight days, and the disease runs an acute course of forty-eight to seventy-two hours, the antitoxin usually gives negative results. When, however, there is a longer incubation period, and the disease tends to run a more subacute course, the antitoxic treatment is very beneficial. Dr. Lambert, in a study of statistics, found that in thirty-one acute cases developing within eight days from the date of infection there was a mortality of sixty-one and one-third per cent., while among similar untreated cases the mortality is considered to be as high as eighty per cent. In forty cases of long incubation and slow onset of symptoms the mortality under antitoxic treatment was but five per cent., while in similar cases without the antitoxin, it usually is as high as forty per cent. Judged by these statistics, made it is true from a small number of cases, antitoxin seems to have positive curative effect in the less acute cases of tetanus. As it is impossible to tell at the outset which cases will be benefited, it seems wise in conjunction with the usual treatment to administer the antitoxin in doses of 20 to 50 c.cm., twice daily, in all cases of tetanus, and to begin the treatment at the very earliest possible moment.

The antitoxic treatment of diphtheria has so frequently and fully been treated, that I will only mention a few points which seem to me to be of special interest. Diphtheria antitoxin is singled out among antitoxins by the success which has attended its employment in the treatment of diphtheria, as vaccine is among immunizing procedures in the prevention of smallpox. The great mass of physicians, especially those having had the greatest experience, are convinced that diphtheria antitoxin in doses of 200 to 300 units will confer immunity against diphtheria during from two to four weeks, and that the period may be lengthened at will by repeated doses. By this means many children's asylums are now kept free from diphtheria. They are further convinced that when cases are seen early, that is at a period when the disease may be readily diagnosticated, but before general poisoning has occurred, antitoxin may be relied upon to arrest, with but very few exceptions, the progress of the disease.

Why is it, may be asked; that two substances such as tetanus and diphtheria antitoxin, so nearly identical in their efficacy as agents for immunization, differ so greatly in curative value? The secret is in the manner in which the two infections begin and progress. The tetanus infection progresses from five to ten days undetected in the wound, the toxins develop unnoticed, cause their deleterious effect, and only after general poisoning has occurred is the disease manifested to the observer. The diphtheria infection starts on the surface, and before its toxins are fully developed and absorbed it is diagnosticated. At such a period the tetanus infection could also be arrested. In diphtheria as in tetanus, if the favorable time is allowed to pass and the constitutional poisoning has occurred, the antitoxin is usually of no avail.

No other bacterial toxins produce such powerful antitoxin as do those of tetanus and diphtheria. The nearest approach is in the case of the plague bacillus. This with its toxins produces in immunized horses a serum which is distinctly antitoxic and bactericidal, so that from one-tenth to one-fortieth of a cubic centimeter will protect a mouse from ten times the fatal dose of toxin or living bacilli. This serum, prepared by Roux and Yersin, has proved to be capable of arresting the plague in monkeys in which the dis-

ease runs a course very similar to that in man. In man the serum has been used in several hundred cases, and given beneficial results both for purposes of immunization and cure, the mortality having been lowered from an average of eighty to fifty per cent.

The serum of animals immunized to streptococcus and pneumococcus toxins and cultures possess bactericidal and antitoxic properties, but of much less power than the plague serums. The streptococcus serum has been most experimented with, and has been obtained in sufficient strength so that a dose of one-fifth cubic centimeter would protect rabbits from one hundred times the fatal dose of streptococci. After infection has developed to any considerable extent the serum is useless. In spite of the many favorable reports of its use in septicemia, erysipelas, and other streptococcus inflammations, there is no doubt that its curative value is limited, and the discovery that it rapidly deteriorates accounts for the fact that practically all of the preparations on the market are valueless.

The serum of animals immunized to tuberculosis is also extremely weak in bactericidal and antitoxic substances. Most preparations show absolutely no immunizing effect. The apparently good results from any serum now on the market are probably due to other measures employed in the treatment.

The new tuberculin of Koch requires improvement before it can be advised for practical application. The experiments of Trudeau and Baldwin as reported in THE MEDICAL NEWS have shown that, as at present prepared, the new serum is not only frequently contaminated, but that most of the vials contain living tubercle bacilli. That these bacilli are capable of causing tuberculosis has been proved by Dr. Baldwin by experiments upon animals, when, in spite of continued tuberculin injections, the animals became infected and died of tuberculosis. It is too early to judge of the therapeutic value of the new tuberculin. It will probably be shown to possess slight curative value in beginning tuberculosis and in lupus. With an improved technic it should be furnished free from bacilli.

Typhoid fever and cholera may be classed together. Animals may be immunized to both, and their serum will be found to contain feeble antitoxic and moderate bactericidal properties. From the results of experiments upon animals, it may be said that injections of the serums or of the dead bacteria into man will produce a fair degree of immunity, which will continue some weeks. The treatment of typhoid fever with serum has not given any marked results, although a few observers have claimed that the attack is shortened.

Although no form of micro-organism has yet been discovered in the brain or spinal cord of men or animals attacked by hydrophobia, nevertheless it is certain that one exists, for the disease is so readily transmitted from animal to animal in characteristic form that skepticism is impossible. The preventive treatment instituted by Pasteur has been subjected to an immense amount of criticism, but I believe its efficacy is to-day finally established. Two objections have been made to the treatment: (1) The proportions of cases developing after the bite is as large in those treated as in those not treated; and (2) that some who would not have developed hydrophobia from the bite developed it from the injection of the virus. As the Health Department intends soon to offer the Pasteur treatment to all who desire it, these criticisms have naturally been very interesting. During a visit at the Pasteur Institute in Paris this summer I carefully inquired concerning these points. It was stated that the apparent diminution in the percentage of those developing hydrophobia after bites by rabid animals is so great, that it is impossible to believe it to be due to misinformation as to the extent the disease formerly occurred. They stated that from time to time a person infected developed rabies two weeks or more after having passed through the whole course of treatment, which is a time when the patient should have been fully immunized. As to the possibility of producing hydrophobia by means of the injections, they believed it had never occurred in the thousands of cases treated at the Institute. Similar testimony comes from all the other institutes.

In order to test experimentally the immunizing value of the Pasteur treatment, numerous experiments have been carried out in the Research Laboratory of the Health Department of New York City by Drs. Wilson and Cabot. These, though not as yet complete, present striking evidence that the injections do produce immunity, and that when properly carried out they are without danger even in very susceptible animals.

The results of the use of vaccine virus in the prevention of smallpox are so nearly universally accepted that they will not be touched upon here. The serum of vaccinated animals contains very feeble curative properties, too feeble for practical use.

As to the future: The outlook is bright for obtaining through serums, or through the toxic substances of the micro-organisms themselves, means for immunizing against most if not all of the bacterial diseases.

This immunity in most instances will not be of long duration. This drawback may be overcome, however, by repeating the immunizing injection. When we have discovered the micro-organisms causing scarlet fever, measles, and the other diseases, in

which a prolonged immunity follows recovery from infection, we may hope to obtain vaccines as efficient as that now used in smallpox. The prospect of obtaining serums which will promptly arrest the further development of a disease by the destruction of the micro-organisms and their poisons already in the body, is rather less encouraging than it appeared to be shortly after the discovery by Behring of the diphtheria antitoxin.

The serum procured from animals immunized by the pneumococcus has only slight curative power, but sufficient has been accomplished to make further investigation imperative. The serum is practically harmless, and physicians who desire to test it would be justified, by the results of experiments already published, in using it in the treatment of cases of pneumococcus infection.

We must remember that all we can hope for is to stop all growth of the micro-organisms and prevent further action of the bacterial poisons at the moment the treatment begins. We cannot hope to benefit the tissue-cells or the activity of organs except by neutralizing certain deleterious products, and thus allow the vital processes and other therapeutic aids a better chance of success.

CLINICAL MEMORANDUM.

A CASE OF LYMPHATIC LEUKEMIA.

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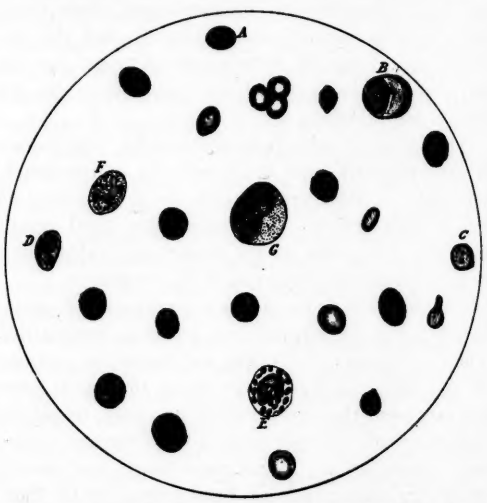
CASES of pure lymphatic leukemia are very rare. We therefore report this case, although an autopsy was not permitted. The clinical features, however, were so characteristic that there can be no doubt as to the correctness of the diagnosis.

Tillie R., aged eleven years, of Russian parentage, was first seen by Dr. A. Friedenwald at the Hebrew Orphan Asylum about April 20, 1896. Finding the patient suffering from a profound anemia he ordered her sent to the Hebrew Hospital. She was admitted to the hospital April 27th, and through the courtesy of Drs. Rosenthal and Wolf we were allowed to observe the case.

We learned that the patient had been in ill health for five or six months previous to admission. She had frequently suffered from nose bleeding, had emaciated markedly, and was constantly languid and tired. She had complained frequently of palpitation of the heart and difficulty in breathing. The family history was negative. On examination the child was found to be very anemic and emaciated. The mucous membranes were extremely pale. Both legs showed signs of ecchymoses. There was no edema and no jaundice. The pulse was feeble, regular, but accelerated (110 beats per minute). There was marked visible pulsation of the veins of the neck. The subaxillary, suboccipital, axillary and inguinal glands were much enlarged, the several glands of each set being distinctly separated from each other. The glands were all very tender to the touch. The respirations were increased in frequency (34 per minute), the lungs were everywhere resonant, the breathing puerile. The apex beat was weak, accelerated and found in the fourth intercostal space just within the mammary line. The heart-sounds were weak, though clear. The abdomen was markedly distended, though the presence of fluid could not be detected. The spleen was much enlarged, extending to within one-finger's breadth above the crest of the ilium and two-fingers' breadth to the right of the umbilicus. It was very tender to the touch. The liver was enlarged, extending to two-fingers' breadth below the costal cartilages. Its upper boundary in the mammary line was the sixth rib.



Blood examination in a case of lymphatic leukemia. *A.* Small mononuclear lymphocyte. *B.* Large mononuclear lymphocyte. *C.* Red blood-cell. *D.* Nucleated red blood-cell. *E.* Eosinophile. *F.* Neutrophile. *G.* Myelocyte. (Objective, one-twelfth oil-immersion lens; eye-piece No. 4.)

The urine was normal. The specific gravity was 1018. Upon microscopic examination crystals of uric acid were found. The ophthalmoscopic examination, made by Dr. Harry Friedenwald, May 3, 1896, was as follows: Papillæ pale and margins blurred. The vessels, both arteries and veins, very tortuous, their color being distinctly lighter than normal. There were dark hemorrhages scattered throughout the posterior portions of both retinæ. For the most part these were small, the largest being half the size of the papillæ; many were but faint reddish discolorations. No white spots were to be seen anywhere in the retinæ. The patient did not seem to be conscious of any impairment of vision.

The patient complained of severe headaches during the next few days, especially marked in the back of the head, and more pronounced in the evening. The appetite was

variable, there being a craving for acid foods. The temperature would rise each evening, reaching its highest point on the evening of May 1st,—104° F.

On May 6th, the patient feeling stronger, she was allowed to sit up for two hours, but at the end of this time she complained of severe pains in both legs and feet, which on examination were found to be markedly edematous. This was the first time this condition was noted. On the following day she became very irritable, there was a total loss of appetite, and nausea developed. She then began to vomit, and diarrhea set in. On May 9th she became very restless and had dyspnea. There was marked edema of the legs, arms, and hands. She died the next morning. Unfortunately no autopsy was allowed.

The examination of the blood was most important and interesting. These examinations were made on a number of different days, but as the results were identical they may be embodied in one report. The drop of blood obtained from the ear was strikingly characteristic of the condition which afterward was made apparent. It resembled sanious pus, rather than blood. Cover-slips were prepared in the usual manner for staining purposes, and differential counts were made in two ways from the fresh blood with the Thoma-Zeiss apparatus: first, Toisson's fluid was used to dilute the blood, and at the same time to stain the leucocytes, and with the special tube which accompanies the instrument the leucocytes were counted; second, a count of the red and white corpuscles was made from the stained specimens with the use of Ehrlich's stops—metal discs with a graduated square perforation in the center which fit into the eye-piece of the microscope. The results from these procedures were the same. The red blood-corpuscles numbered 800,000 per cubic millimeter, a marked oligocythemia, and the white corpuscles, an almost incredible number of 1,200,000, or the phenomenal ratio of two red blood-corpuscles to three whites. The hemoglobin, as estimated with the hemometer of Von Fleischel, registered twenty per cent., which was proportionate to the decrease in the red cells. The blood-slides were stained with a slight modification of Ehrlich's triple stain. Examination revealed that the increase in the white elements was confined exclusively to the small mononuclear lymphocytes, all other varieties of leucocytes being markedly diminished. In the red blood-cells few abnormalities other than the pronounced oligocythemia and the proportionate oligochromemia were observed. Nucleated red blood-corpuscles were present in small numbers, also a few megalocytes, and there was a slight poikilocytosis. In making the differential counts of the white cells, the Ehrlich stops were used and one hundred fields counted. A table giving the proportion of the different elements and the proportion of the different white elements in normal blood is appended.

	Tillie R.	Normal Blood.
Small mononuclear lymphocytes....	97.1	20
Large " " and transitorial forms.....	.3	6
Polynuclear neutrophiles.....	2.	70
Eosinophiles.....	.1	1 to 5
Myelocytes.....	.3	.....

The great increase in the small mononuclear lymphocytes and a proportionate decrease in the polynuclear neutrophiles is striking. The eosinophiles are decreased, the myelocytes rare, which is in marked contrast to splenic myelogenous leukemia in which there is a great abundance of these elements. The presence of an inconsiderable number of myelocytes would not warrant the assumption that we were dealing with a case of mixed leukemia. Myelocytes are occasionally met with in like numbers in various other conditions.

This case is remarkable not only on account of the infrequency of this form of leukemia, but also from the fact that in no other recorded case, which we have been able to discover, has the number of white elements exceeded the red by such a majority.

MEDICAL PROGRESS.

Prognosis in Hemiplegia.—LODOR (*Medicine*, October, 1897) says there are three points which, when taken together, give a fair indication of the permanency of the paralysis in hemiplegia. They are the voluntary motor power of the patient, the spastic rigidity, and the increased reflexes. To reduce the problem to almost a mathematic level, let it be supposed that the fibers composing the pyramidal tract of one side number one hundred. Suppose that ten of the fibers are destroyed by degeneration subsequent to hemorrhage. If such be the case, after a lapse of three to six months, the patient should have recovered nine-tenths of his original power, with the increase in reflex represented by one-tenth and the rigidity or spastic condition scarcely noticeable. On the other hand, suppose that the reflexes are exaggerated one-tenth, the voluntary power reduced to zero, and no rigidity. With such a condition it is fair to suppose that nine-tenths of the fibers are intact and out of the reach of the patient's will, either from former pressure of the clot, or from long disuse, and that recovery may take place to the extent of nine-tenths of the former power. Again, suppose the patient presents the following points: Motor force reduced to one-tenth, reflex markedly increased, and rigidity great. With such symptoms it is fair to presume that approximately nine-tenths of the fibers have been destroyed, and that further recovery cannot take place. Experience has shown that these points are to be relied upon with almost mathematic precision.

Galvanocautery in Procidentia.—MACEVITT (*Brooklyn Med. Jour.*, October, 1897) has had excellent results from the use of the galvanocautery in procidentia. The operation, which is extremely simple, consists in cutting out with the cautery a conical piece of the uterus, including the cervix. The relief of the strain on the uterine ligaments, and the beneficial action of the heat, which extends far beyond the cauterized area, are the means of restoring to the ligaments their natural tone. In order to facilitate this, a large firm tamponade is inserted into the vagina, the cotton used for this purpose being saturated with glycerite of tannin. A new tampon should be inserted every day, preceded by a hot-water douche. This

treatment should be continued for about three weeks, the patient meanwhile remaining in bed with the hips elevated. Tonic treatment should also be administered. In a few months' time there will be a surprising diminution in the size of the remaining portion of the uterus. The only accidents which can happen in the performance of this operation, are the opening of the peritoneum, and the division of the uterine arteries. The former has no significance, as long as the bowel is not injured, and the latter simply means the application of a ligature. The shank of the cautery knife should be covered with cotton to protect the vagina from being scorched.

Prescribe Alcohol, not Whisky.—In the *Jour. of the Amer. Med. Assoc.*, August 21, 1897, is an article by DAVIS on the therapeutic properties of alcohol, and the reasons why the fermented and distilled liquors used as beverages should not be recognized in the pharmacopeia as medicinal agents. All the possible beneficial affects to be obtained from them may be derived from a suitably diluted alcohol, and by prescribing this, instead of wine, beer, whisky, and brandy, the doctor knows exactly how much alcohol he is administering—something which is impossible if the beverages are employed, as the percentage of alcohol in them is subject to such wide variations. Besides, all of these liquors contain other substances, many of which are injurious, and which may be excluded, if the plan advocated is adopted. Moreover, there is considerable saving of expense to the patient. Consequently, it is far more economic, as well as more accurate, for every physician to prescribe pure alcohol and water, to be administered with such quantity of sugar, milk, or meat broth, as in his judgment is required. It would be a very great step in advance, if in the next revision of the Pharmacopeia, only alcohol of standard strength should be retained, to the exclusion of all fermented and distilled liquors. If these changes were adopted and carried into general practice, the result would be a more complete separation of both pharmacist and physician from connection with, or responsibility for, the sale or use of the various popular alcoholic beverages.

THERAPEUTIC NOTES.

Saline Solutions in Obstetrics.—In the October number of *Medicine*, BACON makes a plea for a more general use of injections of saline solutions in obstetrics. Many physicians are forgetful of the value of this method of treatment, and few realize how very simple is the technic necessary for its employment. The good results attending its use in severe hemorrhage are well known. Although it is difficult to estimate the amount of blood lost during delivery, it is not far out of the way to say that a completely saturated sheet will contain two pounds. A deduction must be made for the amniotic fluid. In cases of hemorrhage of the "second degree," that is when from one-fourth to one-half of the blood in the body is lost (2.5 to 5 pounds), the importance of prompt therapeutic aid is very great. Absorption from the rectum of an injection though slow and rather uncertain, does well enough in the less severe cases, but when a patient has lost from two to five pounds of blood, it is necessary to use some quicker method to supply the required fluid in the vessels. This can best be accomplished by hypodermic injection, and the following simple rules are sufficiently accurate: A teaspoon of medium size is filled level-full of fine table salt, which is put into a pint of water and boiled. A hypodermic needle fitted to the end of three feet of rubber tubing and then filled with the solution is thrust into the inner side of the thigh; or by using a glass Y-tube, two needles may be used at the same time, one in each thigh. The saline solution is allowed to flow through the tube, no force but that of gravity being necessary. Constant massage is made about the point of the needle to assist in disposing of the fluid. In this manner from twenty-four to thirty-two ounces may be introduced in fifteen minutes, if the irrigator is raised three feet. Not more than a quart of fluid should be given at one time; if necessary, the injection may be repeated in an hour or two.

It is well understood that in eclampsia the toxicity of the blood-serum is increased. Whatever their nature, the poisons are not excreted by the kidneys fast enough. To increase the rapidity of excretion has been the rule of treatment. Formerly, venesection was employed to remove a part of the poisoned blood, while transudation from the lymph spaces, diluted that which remained. This dilution may also be obtained by the injection of saline solution. If a patient be plethoric, from twenty to forty ounces of blood should be withdrawn, and its place taken by the injected saline solution. In anemic patients it is better to make the injection without venesection. The salt solution is a valuable diuretic, diaphoretic, and purgative, as well as a diluent of the blood.

The treatment of puerperal fever by saline injections has been tried on the supposition that by dilution of the bacterial toxins and hastening their elimination, the condition of the patient will be improved. The successes are too few to permit an advocacy of the procedure in these cases. In fact the treatment of this dire affection has made practically no progress for three decades.

The Proper Method of Preparing Yellow Oxid of Mercury Ointment.—KEIPER (*Ophth. Record*, September, 1897) says that carelessness in the preparation of the ointment of the yellow oxid of mercury deprives this excellent application of much of its value. As in making a flour paste it is a matter of common sense not to dump all of the flour at once into the water, so in the preparation of this ointment the mortar and pestle should first be smeared with a little vaselin, and the mercury added in minute quantities, and thoroughly incorporated, adding then a little vaselin and again a little mercury until the whole is made into a smooth paste. This requires a considerable expenditure of time, but the result warrants it. The mixing may be somewhat facilitated by warming the mortar. When finished, the ointment must be kept in glass or porcelain.

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SATURDAY, NOVEMBER 6, 1897.

SEWAGE FARMS AND THE PUBLIC HEALTH.

GREAT progress has recently been made by a number of American cities in the methods of disposing of garbage, but few, if any, have yet attempted to deal rationally with the question of sewage disposal. As a rule, the easiest and apparently most economic method has been adopted, with the result that beautiful streams and waterways are contaminated to a degree which renders them a menace to the health of the communities along their banks. The system of "sewage farms" which utilizes to the best advantage the vast wealth of fertilizing material contained in the refuse of urban life, returning it, as it were, to the soil from whence it came, and preventing it from ultimately being lost in the depths of the sea, is the most practical method of dealing with the question.

Theoretically, many objections may be raised against this system which would be sufficient to condemn it, were it not for the fact that it has been tried, has proved to be unobjectionable, and is now in use in a surprisingly large number of transatlantic cities. For instance, England has fifty large sewage farms, and more than one hundred smaller ones. France and Germany have not adopted the system to the same extent, but it is rapidly growing in favor. Berlin, Danzig, Breslau, and Freiburg are the most important cities of Germany that have adopted the system. From an article read by Dr. Theodore Weyl before the Berlin Medical Society, we learn that Breslau has had a sewage farm in operation since 1559, while the city of Edinburgh has used one farm for the disposal of all its organic refuse during one hundred and fifty years.

The most salient objections raised to the system are: that the sewage farms will cause an intolerable stench; that the earth will become saturated after a short time, and necessitate the employment of constantly widening areas appropriated to this purpose; and that sewage farms are likely to be an excellent culture-ground for the germs of infectious diseases. Dr. Weyl discusses these various objections, and answers them in a most convincing manner. Practically, the odors emitted are of no consequence. An English Parliamentary Commission, appointed to investigate the subject, reported through its expert, Dr. Carpenter, that the sewage farm of Norwood, in the vicinity of London, is so free from objections of this nature that a favorite promenade leads directly across its fields. Colin investigated a complaint about a sewage farm on the Seine, and found that the odor was due, not to the sewage, but to chemical works located near by. Incidentally the fact was brought out by this investigator, that schools had been established on the sewage farms, and that there was not an unusual amount of sickness among the pupils in consequence. In regard to the saturation of the soil and the failure of the mineral constituents to neutralize the organic substances, the fact that the city of Edinburgh has used one sewage farm continuously for so long, and that neither experience there or at Danzig, or Berlin, supports the assumption, is sufficient answer to this objection. The famous English hygienist, Corfield, confirms the observations made at Berlin and Paris, that only the soil of badly managed sewage farms can possibly become saturated. The character of the country which it is proposed to devote to one of these farms must be carefully considered in order that efficient drainage may be obtained.

The fear that these farms may become a source of disease seems absolutely unfounded. The medical officers of the English Commission above referred to,

through Dr. Littlejohn, deposed that in the year 1865–'66, when cholera raged in Edinburgh and London, the inhabitants of the respective sewage farms remained free from the disease. When Paris undertook the first sewage reform, the owners of villas in the vicinity of the proposed farms opposed their establishment, whereupon the French government appointed a commission of investigation, which published very elaborate reports. One of these was compiled by Bertillon, and in it was compared the mortality of the *arrondissement* in which the sewage fields were located with the neighboring *arrondissements*. On the sewage farms, taking the average for several years, six or seven persons per thousand died annually of typhoid fever. The same ratio, seven per thousand, held good for the other localities. The same was true in regard to deaths from diphtheria. The French military surgeon, Vallin, found that the mortality from typhoid among the garrisons of Southern France, namely, at Marseilles and Montpelier, was respectively fifty-six and fifty-seven per thousand. For the same number of soldiers in Northern France, namely, in Arres and Douai, it was five and thirteen per thousand. In Northern France sewage is disposed of by spreading it upon the fields as in the time of the Celts, and in spite of this rather barbaric method no unfavorable effect has been observed.

The sewage farms of Berlin are the largest in the world. Statistics have been preserved relative to their sanitary condition, extending over a period of fifteen years according to a system elaborated by Virchow. These statistics show that the inhabitants of sewage farms and their neighborhood maintain an average health in advance of that of Berlin. Moreover, mortality among children living upon these farms has been less than that among children in the city. As to dysentery, intermittent fever, measles, and scarlatina, the percentage of sickness and of death has also been lower on the sewage farms. Moreover, Professor Virchow affirms that in no instance could cases of typhoid fever be ascribed to infection from these farms except in instances in which the patients had drunk the sewage water.

The vegetables and various products of these farms are not only used for food by the people who inhabit them, but are sold in the markets of the neighboring villages and towns. Even lettuce and celery have not been charged with having conveyed disease.

OUR QUARANTINE AS IT IS AND AS IT SHOULD BE.

THE first step toward the inauguration of a National Department of Public Health necessitates a complete reorganization of our present system of quarantine. Let us examine for a moment this important branch of National sanitation. There are at present sixty-eight quarantine stations on our seaboard. These are divided according to their purpose into simple inspection stations, of which there are forty-four, and quarantine stations proper, of which there are twenty-four. Of the latter, eleven are National, conducted by the Marine Hospital Service, and thirteen are under the jurisdiction of State or local authority. Of the inspection stations six are National and thirty-six, State or local. This division of administrative authority is responsible for most of the abuses and shortcomings which mark the system. It gives rise to unnecessary stations and to the overlapping which frequently occurs. For instance, in addition to a National Quarantine Station at the Delaware Breakwater and another at Reedy Island, further up the Bay, there is a local quarantine and boarding station at Marcus Hook, eighteen miles below Philadelphia. That the last-named is unnecessary is evident to anyone; for all ports on Delaware Bay are fully protected by the Government stations.

Should it be asked what is the actual *raison d'être* of the supernumerary station, it would be difficult to answer, unless it is to give employment to the necessary officials. That this statement may not appear unwarranted, let us inquire into the work which has been accomplished at this station. A year and one-half ago it did not possess an apparatus for the disinfection of vessels and baggage, and had no facilities for the removal and detention of suspected individuals. Quarantine was maintained under United States Treasury laws and the laws of Pennsylvania; but the quarantine procedures were those of the Treasury Department. Any vessel having on board a case of cholera, yellow fever, or smallpox was (or would be) returned to the Federal quarantine at Reedy Island.[1]

Such is the local quarantine station of a port where 1379 vessels arrive during a year.

To make a long story short, when nothing is re-

[1] "Report of Inspection," by Surgeon George Purviance, M. H. S. "Annual Report of the Supervising Surgeon-General of the Marine Hospital Service of the United States for the Fiscal Year 1896."

quired but perfunctory inspections and the collection of fees, the Marcus Hook Station is amply sufficient; but should an emergency arise, calling for the exercise of genuine quarantine functions, it would be necessary to call upon the National Quarantine Station at Reedy Island conducted by the Marine Hospital Service, where vessels and baggage can be disinfected and suspects removed and detained.

This is not an isolated instance as is proved by the fact that the same condition exists at the local quarantine stations of Charleston, S. C., Savannah, Ga., Fernandina, Fla., Mobile, Ala., Sabine Pass, and Galveston, Texas. The palpable absurdity of a system so conducted that a pest-ship must go from Texas ports to Ship Island, Miss., or from Charleston or Savannah to Sapel's Island, Ga., for quarantine is manifest to the most casual observer. Such a system is inefficacious, onerous, and inhuman.

While, of course, the function of quarantine is the protection of the public from an invading disease, its enforcement should be as free from harsh exactions as is compatible with efficiency, and the expense to commerce should be reduced to a minimum. That a pest-ship should be obliged to go out of its course a hundred miles or more to be disinfected is a sufficient evil in itself; but that the sick, often without medical care, and the well, in constant danger of infection, should be penned up in the same vessel, perhaps for several days, is barbarous.

A system of quarantine which is just and humane, at the same time that it is efficient, should at once remove the sick to a hospital, should have means for comfortably caring for the well, but possibly infected, should possess the necessary apparatus for the speedy disinfection of vessels, baggage, merchandize, and clothing.

Another strong argument in favor of a uniform and National control of quarantine is the great benefit which would accrue to ports of entry by the abolishment of the sometimes onerous taxes and fees. It is enough for shipping to be obliged to pay pilotage, custom's fines, harbor dues, towage, and lighterage, one or all, as it must in many ports, without having to pay inspection and other fees to local quarantine officers. Ships entering ports protected by National quarantine stations do not pay inspection fees, and when occasion arises are disinfected free of charge, and their sick are likewise gratuitously cared for. In the very next port, perhaps protected by a local or State quarantine station, all these compulsory attentions must be well paid for. Such discrimination militates in favor of the free port, and has induced commercial organizations in many instances to advocate a National quarantine. As Surgeon-General Wyman has said, "there are quarantines for protection and quarantines for revenue." The latter, all State or local affairs, should be promptly abolished in the interests of commerce, economy, science, and humanity. By lack of uniformity, they are a constant menace. By reason of local and political character, their personnel is often unscientific and is always changing. In fact, from no standpoint except perhaps a selfish one can the present dual system be defended.

The Marine Hospital Service has proved itself capable of conducting quarantine affairs scientifically, economically, and uniformly. Let us, therefore, place under its jurisdiction a quarantine service which of necessity will be uniformly and justly administered and supported, as an efficient quarantine must be, by Federal authority.

ECHOES AND NEWS.

Gum-Chewing.—The *British Medical Journal* deplores the fact that the habit of gum-chewing, "so prevalent in the United States," is on the increase in England.

Bequests to Charity.—By the will of the late Caroline Talman of New York City, $135,000 is left to New York charitable institutions and societies, of which the Home for Incurables receives $5000; Free Church House for Incurables, $3000; St. Luke's Hospital, $5000.

Changes at Bellevue Hospital.—By order of the Commissioners of Charities, fifteen employees at Bellevue Hospital have been discharged on account of lack of funds to meet the running expenses. The salaries of the places made vacant vary from $240 to $600 a year.

Diphtheria on Staten Island.—Within the past two weeks twenty-seven cases of diphtheria, with four deaths, have occurred at Stapleton, Staten Island. The local physicians claim that they have the disease under control and no apprehension is felt in regard to a spread of the infection.

Winter Gardens for the Poor.—The recreation-piers which have been constructed in New York during the past season will be enclosed with glass and fitted up as winter gardens. They will be heated, lighted with electricity, decorated with plants, flowers, fountains, etc. Three of them will be ready for occupancy before the new year.

Obstetrical Society Elections.—At the last meeting of the New York Obstetrical Society the following were elected

officers for the ensuing year: President, Dr. W. Gill Wylie; first vice-president, Dr. J. C. Edgar; second vice-president, Dr. A. M. Jacobus; recording secretary, Dr. Le Roy Broun; assistant recording secretary, Dr. Geo. W. Jarman; corresponding secretary, Dr. E. B. Cragin; treasurer, Dr. J. Lee Morrill; pathologist, Dr. Geo. C. Freeborn.

The Pathogenic Role of Dust.—According to a communication recently read before the Paris Academy of Medicine, the floors of dwellings are as fruitful and dangerous a cause of infection as drinking-water. It is stated that, with the exception of typhoid fever and cholera, which are almost always spread by means of water, by far the greater part of other infectious maladies, such as the eruptive fevers, diphtheria, pneumonia, and, above all, tuberculosis, almost always arise from germs preserved in dust, except when direct infection takes place.

Verdict for a Hospital.—A suit for $30,000 was recently brought by a woman against St. Vincent's Hospital, New York, for injuries received while in the hospital as a private patient. The woman was operated upon and was badly burned by an unprotected hot-water bag which was placed in her bed. The facts in the case were not disputed, but counsel for the hospital asked that a verdict be given for the defendants on the ground that all reasonable precautions had been taken by the management, and that the negligence was the fault of the nurse alone. A verdict was rendered in favor of the hospital.

Serum Diagnosis of Typhoid Fever. — Surgeon-major Smith of the Army Medical School at Netley, England, has been applying the serum test in groups of cases of diarrhea which have accompanied the typhoid epidemic at Maidstone. The results of his tests show that it is unsafe without a controlling bacteriologic examination, to infer that cases of diarrhea which occur before or in the course of epidemics of typhoid fever are in any way the cause or consequence of the prevailing epidemic. In other words, his experiments failed to show the presence of the typhoid reaction in cases characterized by diarrhea only.

Dangers Attending Bacteriologic Work.—Surgeon-major Semple, attached to the Army Medical School at Netley, England, recently scratched his hand with a hypodermic needle when immunizing a horse for the preparation of serum against Malta fever. Shortly after this he developed the symptoms of the fever, and his blood when examined gave a typical reaction of the micrococcus of Malta fever when diluted 1-1000. As an act of poetic justice, the horse which he was immunizing has been bled, and has supplied two injections of its serum to his immunizer. The patient is responding to the treatment and gives promise of speedy recovery.

Bubonic Plague in India and China.—It is officially announced in Bombay that an outbreak of plague has occurred in the Jalandhar district of the Punjab, and the village where the disease has made its appearance has been cordoned. There are 294 cases in the hospitals at Poonah, and 115 cases are being cared for at Bombay. The United States consul at Amoy, China, in his report to Washington, says that the plague has died out at that place after running for three months. Nearly 90 per cent. of the persons attacked succumbed to the disease, but no foreigner contracted it. In Amoy and four adjoining towns there were 250 deaths from the plague daily during June, 400 daily during July, 200 daily during the first fifteen days of August, and 100 during the latter part of that month.

Starvation in Cuba.—Sanitary Inspector Brunner, in his last report to Surgeon-General Wyman of the Marine Hospital Service, reports seven deaths from starvation in Havana for the week ending October 7th, and twenty-one for the week ending October 14th. He also reports an increase in intestinal diseases due to the diminished food-supply, and estimates that two-fifths of the total deaths of the city are due to this cause. He calls attention to Los Fosos, a place set aside for the country people sent to Havana, and which he describes as a pest-hole. It is a large wooden building, 60x50 feet, situated in an inclosure which is used for storing the carts of the municipality. Of the 500 persons in this building, which is *not* a hospital, over 200 were found lying on the floor, sick and dying. All the children under ten years of age are suffering from enteritis or dysentery, and their emaciation is startling. About ten die every day. The civil hospitals are full to overflowing and are refusing patients, one—the Mercedes—capable of properly caring for 200 patients, now has nearly 500.

Lodge Doctors Not Allowed in Quebec.—The resolution passed by the College of Physicians and Surgeons of the Province of Quebec prohibiting medical men from accepting the position of lodge doctor was moved by Dr. J. B. McConnell, and seconded by Dr. S. Gautheir. It is as follows: "In view of the extent to which the members of the medical profession are defrauded of proper remuneration for professional services, owing to the acceptance by many of positions as medical officers to various benefit societies, lodges, etc., where remumeration is arranged for by contract, it be considered beneath the dignity of our profession to accept and hold such positions. In order that all professional services shall be awarded remuneration not less than the tariff adopted by this board, it is hereby enacted that members of the College of Physicians and Surgeons of the Province of Quebec shall be prohibited from accepting or retaining the position of lodge doctor where a stipulated amount is paid annually or otherwise for professional services amounting to less than the minimum tariff adopted by this board, or from attendance upon families, groups of families, or other associations, at contract prices, which name a stated amount for a certain term, usually an annual fee, and that no physician shall be permitted to retain membership in this college or practice in this Province who accepts such positions." The College of Physicians and Surgeons has the power to revoke all licenses to practice medicine or surgery in the Province.

Health Reports.—The following statistics, concerning smallpox, yellow fever, cholera, and plague, have been received in the office of the Supervising Surgeon-General of the United States Marine Hospital Service during the week ended October 30, 1897:

YELLOW FEVER—UNITED STATES.

		Cases.	Deaths.
Mobile, Ala.	October 23–29	40	5
Montgomery, "	October 21–29	99	6
Notasulga, "	October 25	1	0
Sandy Ridge, "	October 25	1	0
Selma, "	October 23–26	17	1
Whistler, "	October 29	not stated	2
Atlanta, Ga.	October 24	1 (refugee)	
" "	October 27	1 (d't camp)	
Baton Rouge, La.	October 22–28	3	..
Franklin, "	October 20–21	2	..
New Orleans, "	October 23–29	367	52
Petterson, "	October 21	1	..
Bay St. Louis, Miss.	October 23–28	33	3
Biloxi, "	October 23–29	91	5
Cayuga, "	October 23–28	5	..
Clinton, "	October 23–29	7	..
County Farm, "	October 25	1	..
Edwards, "	October 23–29	19	1
Hinds Co. convict camp.	October 23–27	6	..
McHenry, "	October 23–29	6	..
Nitta Yuma, "	October 23–24	6	..
Pascagoula, "	October 23–29	11	..
Scranton, "	October 23–29	75	4
Memphis, Tenn.	October 23–29	31	3
Galveston, Texas.	October 27	yellow fever present	

YELLOW FEVER—FOREIGN.

Para, Brazil	October 2–9	..	5
Cienfuegos, Cuba	October 10–17	..	2
Havana, "	October 14–21	..	13
Matanzas, "	October 6–20	..	6
Kingston, Jamaica	July 9–October 9	44	23
Manchester, "	July 9–October 9	7	2
Port Antonio, "	July 9–October 9	1	1
St. Elizabeth "	July 9–October 9	1	1
San Salvador	July 1–31	38	11
"	August 1–31	54	16
"	September 1–30	34	12

CHOLERA—FOREIGN.

Hong Kong, China	September 4–11	..	1
Calcutta, India	September 11–25	..	21
Madras, "	October 18–23	..	7
Singapore, "	August 1–31	..	1
Kanagawa Ken, Japan	September 23–30	1	1
Tokyo Fu, "	September 23–30	3	2

PLAGUE—FOREIGN.

Bombay, India	September 14–21	..	35

SMALLPOX—UNITED STATES.

New Orleans, La.	October 16–23	1	..
McKeesport, Penn.	October 16–23	..	1

SMALLPOX—FOREIGN.

Alexandria, Egypt	August 7–September 16.	..	2
Cairo, "	August 7–September 16.	..	6
Calcutta, India	September 4–25	..	3
Glasgow, Scotland	October 2–9	10	..
Odessa, Russia	October 2–9	1	..
Moscow, "	September 25–October 2.	3	1
St. Petersburg, "	October 2–9	4	4
Warsaw, "	October 2–9	..	10

The "Massage-Treatment."—It is well-known that massage, an excellent thing when medically prescribed and scientifically applied, is not only hazardous but positively injurious when an individual puts himself in the hands of the average "masseur," who is usually ignorant of anatomy and physiology. In cases where there is a gouty diathesis, ignorantly applied massage of muscles infiltrated with uric-acid poison creates as much histolytic waste as a brisk six-mile walk, and calls upon the kidneys for an excretory effort quite beyond their powers. Repeated day after day and unmodified by circumstances, this process is destructive to the already damaged kidney, and the patient finds he is rid of a certain amount of pain at the expense of a chronic renal incompetency and eventual uremia. In England and on the Continent this history is so commonly elicited that the condition is known as "massage-kidney."—*London Lancet.*

Progress at Craig Colony During the Past Year.—The Craig Colony for epileptics at Sonyea, Livingston County, N. Y., closed its fourth fiscal year September 30, 1897. There were at that time 214 patients in the colony, the majority of whom had been transferred from the various county houses throughout the State. New buildings are in course of construction which, when completed, will enable the colony to accommodate 140 additional patients, making the total number about 350. It is estimated by State charity officials that this number represents about one-third of the total number of epileptics now a public charge throughout the State. The medical superintendent, Dr. William P. Spratling, reports a great increase in the value of agricultural and industrial products of the colony over last year, so that the ratio of earnings of the patients to the cost of their maintenance is even larger than that of last year, which was a little over 50 per cent. A laboratory for the use of a pathologist and pathologic chemist is being constructed. Dr. Christian A. Herter of New York has been appointed pathologic chemist, and Dr. Ira Van Giesen of New York, consulting pathologist to the colony. Dr. Frederick Peterson of New York was re-elected president of the board of managers. The managers, at their annual meeting, decided to ask the coming legislature for $200,000 for dormitory buildings in order that they may increase the residence capacity of the colony for patients.

ANNOUNCEMENT.

THE SEPARATION FOR DIAGNOSTIC PURPOSES OF THE TYPHOID BACILLI FROM THE STOOLS AND URINE IN CASES OF TYPHOID FEVER—A NEW METHOD.

BY THE NEW YORK BOARD OF HEALTH.

THE examination of specimens of blood from cases of suspected typhoid fever for the Widal reaction has been of great assistance in diagnosis. Occasionally, however, the agglutinating substances do not develop in the blood at any time, or only very late in the course of the disease, or an earlier infection cannot be excluded, owing to the lack of a reliable previous history. In these instances the Widal test fails to give the information desired.

Bacteriologists have long sought for a rapid and certain

method of obtaining and identifying in pure culture the typhoid bacillus from the stools and urine in cases of typhoid fever; but hitherto without satisfactory results. Dr. Hiss, Assistant Bacteriologist to the Health Department, has devised a method, by which it is believed it will now be possible to recover and identify the typhoid bacilli within less than forty-eight hours, from specimens of feces and urine containing them. The Health Department desires to thoroughly test this method and is prepared to undertake these examinations, if proper specimens are furnished.

While definite knowledge is lacking as to the number of typhoid bacilli usually present in the stools of typhoid patients, and as to the time of their appearance and disappearance, it is believed that they are generally present in the discharges, not only during the height of the disease, but also, though to a less extent, at its commencement and for a considerable time during convalescence. The appearance of the bacilli in the urine is usually later than in the feces. The experience thus far obtained seems to indicate that the bacilli may be obtained from about fifty per cent. of all cases on the first examination, and from about ninety per cent. after repeated examinations. The Health Board hopes that these examinations will prove of value, not only for diagnostic purposes, but also in solving important sanitary questions relating to the presence in and time of disappearance of the bacilli from the stools during convalescence.

Physicians are requested to send specimens of intestinal discharges and urine from well-defined cases of typhoid fever, and also from all doubtful cases in which the Widal test has failed to give definite information.

It must be understood that, as yet, these investigations are largely experimental; but that when the typhoid bacilli are isolated in culture an absolute diagnosis of typhoid infection is obtained.

DIRECTIONS FOR PREPARING SPECIMENS OF FECES OR URINE FOR EXAMINATION.

Care should be taken to send, if possible, a specimen obtained from a natural movement, or one following a simple enema. No disinfectants, of course, should be employed. If the movement is formed, the portion from the part last passed, that is, the portion coming from highest up in the intestine, should be selected. In cases complicated by colitis, care should be observed to avoid, if possible, the selection of a specimen largely composed of mucous.

The specimen is collected by seizing a small portion of the discharges between the two slips of wood accompanying the outfit, and placing this in a bottle. The top of the bottle is replaced and the specimen returned to a culture-station or to the laboratory.

Specimens of urine should be received directly into the bottle accompanying the outfit, or should be collected in an absolutely clean vessel and immediately transferred to this bottle, which is then returned to a culture-station, or to the laboratory.

The necessary outfits, with directions and blanks, may be obtained at the various Health Department Depots, where diphtheria culture-tubes, antitoxin, and other products are supplied. The accompanying blank should be fully filled out in every case.

DIRECTIONS FOR PREPARING SPECIMENS OF BLOOD.

The skin covering the tip of the finger is thoroughly cleansed and then pricked with a clean needle deeply enough to cause several drops of blood to exude. Two large drops are then placed on the glass slide, one near either end, and allowed to dry without being spread out on the surface of the slide. After they have dried, the slide is placed in the holder and returned in the addressed envelope to a culture-station, or mailed to the laboratory. The blank giving the history of the case must be filled out in full and forwarded with each specimen. The data thus obtained are for record.

DIRECTIONS FOR OBTAINING SPECIMENS OF SERUM FROM BLISTERS.

The shield (designed to protect the blister from rupture), is stripped from its protecting gauze and applied to the skin somewhere on the anterior portion of the body. The piece of canthos plaster is then fixed within its center. After ten to twelve hours, the shield is removed and one of the ends of the small glass tube accompanying the outfit is introduced into the blister. The tube, both ends of which should be open, should be held so that the end inserted is higher than the other, to allow the serum to run into it. After the tube has been nearly filled, it is removed and the ends sealed by holding them a moment in a gas flame. Care must be observed not to heat the middle portion of the tube, and thus coagulate the serum. The tube so prepared is then placed in the wooden box and returned in the addressed envelope to a culture-station, or mailed to the laboratory.

A report on the result of the examination will be mailed to the attending physician on the following day.

CHARLES G. WILSON, *President.*
GEORGE B. FOWLER, M.D., *Commissioner of Health.*
EMMONS CLARK, *Secretary.*

CORRESPONDENCE.

THE CHARITIES COMMISSIONERS' FATAL PRECEDENT.

To the Editor of THE MEDICAL NEWS.

DEAR SIR: THE MEDICAL NEWS of October 30, 1897, in an editorial on this subject, reflects so severely upon the manner of my recent appointment as visiting physician to Bellevue Hospital that I am forced to conclude that the article was based upon misinformation or misapprehension of the actual facts, and to ask you, as a matter of fairness and justice, to publish the other side of the story. As little autobiography as possible will be inflicted upon the patience of your readers.

For some years prior to October, 1895, the writer had been visiting physician to Gouverneur Hospital, but in the reorganization of the Charities Department at that time, he was one of those summarily removed without cause. The different nominating bodies, however, expressed regret at his removal, and one of them—the Bel-

levue Hospital Medical College faculty—reinstated him as their medical representative in Gouverneur Hospital. Another nominating body—the fourth or non-collegiate division of Bellevue Hospital—tendered him the unsolicited position of assistant visiting physician to Bellevue Hospital for the year 1896. At the end of 1896 this appointment was renewed for the year 1897 with many assurances of satisfaction with the work of the assistant visiting physician.

This commendation of his work and evidence of confidence on the part of his principals encouraged the assistant physician to ask for a nomination for the post of visiting physician when a vacancy occurred during the summer of 1897. He adhered strictly to the "time-consecrated method of procedure," and sought this professional honor, as he has sought and obtained other professional honors—entirely at the hands of his colleagues in medicine; in this instance at the hands of men whose absences from duty he had been covering for eighteen months. To his amazement he was informed by four of the six members of the division that no applications for the position could be considered, as the appointment had been promised to one man three years before the vacancy occurred, and that this man's name, and no other, would be sent to the Commissioners for appointment. He thereupon appealed to the Commissioners against the injustice of this discrimination, and the Commissioners, believing with him that the fourth division had no reason for official existence, except in the claim that they represented the whole of that portion of the medical profession not engaged in teaching in the three prominent colleges, decided that this restriction of the appointment practically to one man in the whole profession was an example of that "hasty and nepotistic action" which is so much deplored in the editorial referred to.

The Commissioners returned the nomination, but they *did* assign their reasons and they *did* ask that more than one name be submitted to them, unless the nominating body were prepared to show cause why the other candidates (and the writer of this communication had very good company to whom a nomination was also denied) were unworthy to be considered.

The fourth division responded to this by submitting a plan by which more than one appointment could be made, but the plan was so outrageous an invasion of the rights of others, that the writer preferred to sacrifice his chance of appointment under it than to be a party to such a scheme.

The Commissioners then grew tired of waiting to see a simple act of justice done, and took away from the fourth division the power to make the nominations at all, leaving to the colleges, however, all their previous privileges. Hereafter, any reputable member of the medical profession may apply for a vacant position in that one-quarter of the hospital service which is not already assigned to the three undergraduate medical schools, with the certainty that neither nepotism, nor lack of social connections, nor absence of financial stability, nor lack of college affiliations, can prevent his claim from at least being considered.

It may be possible to demonstrate that a man who has spent the best years of his life laboring among the poor will not be the man to use a position in the hospitals of the poor "to advance personal interests and emoluments at the sacrifice of science and of the patients whom circumstances confide to his care," even though his appointment may have been made "in a manner entirely at variance with traditional methods."

Respectfully yours,

CHAS. E. NAMMACK, M.D.,
Visiting Physician to Bellevue and Gouverneur Hospitals.
42 EAST TWENTY-NINTH STREET,
NEW YORK, November 1, 1897.

[It appears that it would be in order for the majority of the fourth division to rise and explain.—ED.]

OUR PHILADELPHIA LETTER.

[From our Special Correspondent.]

TYPHOID FEVER AND MUNICIPAL WATER-SUPPLIES—THE PURE FOOD LAW—POLICE AND FIRE DEPARTMENTS AND FIRST AID TO THE INJURED—ADDITIONS TO THE GERMANTOWN HOSPITAL—DR. FORD'S SUCCESSOR.

PHILADELPHIA, October 30, 1897.

AN elaborate and interesting report of the death-rate from enteric fever in different cities in relation to the character of their water-supplies has been recently issued by the Director of Public Works of this city, and this comprehensive review of the question has shown, as has been done in the past by other inquiries on this topic, the great difference in mortality in favor of the cities using filtration over those cities in which the water-supply is unfiltered. The statistics of sixty-six different cities have been compared, according to their death-rate from typhoid during a period of five years, and the results of this classification have been anything but complimentary to Philadelphia, which in comparative immunity from typhoid ranks forty-fifth in the list. Of the more important cities in the group, according to their relative immunity, are the following: Dresden, 4; Berlin, 8; Amsterdam, 10; London, 13; Edinburg, 14; Brooklyn, 16; New York, 17; New Orleans, 18; Hamburg, 21; Paris, 25; Boston, 30; San Francisco, 38; Baltimore, 41; St. Louis, 43; and Philadelphia, 45. Looking at the matter from another standpoint, it will be found that during the five years covered by these statistics the death-rate from typhoid fever per 100,000 people in Philadelphia was 243, while in the Hague, where sand-dune filtration is employed, the rate was but 24, and in Rotterdam, another city using thorough filtration, the mortality was only 26. This argument for the filtration of the water-supply of Philadelphia, which has been for many years earnestly desired by all who understand its value, should be effective in hastening the passage of an ordinance for the establishment of filtration-plants on a large scale; and it is to be hoped that the experimental filtration-station lately authorized by the city authorities will pave the way to its universal application in this city.

The "Pure Food Law" which was passed by the State Legislature early last summer and which was technically in force at that time, has in reality not been put into practi-

cal use until within the past two weeks, when the public were first acquainted with the act by the issuance of an official pamphlet by the State printer. *Apropos* of the discussion at present going on in Philadelphia concerning milk adulteration, it may be of interest to note the provisions of the new law regarding this important food-stuff. One section says: "That the sale or offering for sale of milk or cream for human consumption to which has been added boric-acid salt, boric acid, salicylic acid, salicylate of soda, or any injurious compound or substance for artificially coloring the same, shall be punished by a fine of not less than $50 or more than $100, or by imprisonment not exceeding sixty days, or both, at the discretion of the court." Similar fines are imposed by the act for the sale of cheese not the legitimate product of pure unadulterated milk, or any cheese to which have been added foreign fats or substances. Other laws of a similar character forbid the employment in bake-shops of persons affected with tuberculosis or any other infectious or contagious disease, and forbid the importation into this State of dairy cows, except upon a certificate of freedom from tuberculosis issued by an official inspector.

In compliance with an order recently issued by the Director of Public Safety in the matter of instructing the city police and fire departments in methods of rendering first aid to injured persons, a regular course of instruction on this subject is to be given to the policemen and firemen of the various districts. This course includes simple methods of controlling hemorrhage, the treatment of different varieties of wounds, and directions for rendering first aid in cases of drowning, strangulation, unconsciousness, insolation, heat-exhaustion, and poisoning. The previous lectures in past years are said to have borne good results, and it is thought that this systematic instruction will be effectual in many instances in relieving pain and in saving life by prompt and proper action before the arrival of regular medical aid.

The new annex to St. Timothy's Hospital is almost completed, and will be open early during November. The new building is two and one-half stories in height, and is connected with the main hospital building by a covered passageway. The annex will be chiefly used as a receiving-ward, and in addition contains a large women's ward on one of the upper floors.

Important additions necessitated by the large increase in number of its patients are being made to the Germantown Hospital. The improvement consists in the erection of two large wings adjoining the hospital proper, one of which is to serve as a children's ward, and the other to be used for an operating-room, and for dispensary purposes. It is intended that the new buildings shall be open for patients before the close of the year,

At a special meeting of the Board of Health A. A. Hirst, who has been a member of the board for twenty-two years, was elected President, *pro. tem.*, in place of Dr. William H. Ford, deceased, and J. Lewis Good was elected Secretary, the place held for many years by Mr. Hirst.

At the request of Director Riter, the New York city authorities will be asked to take precautions against the escape of certain lepers now living in a tent near Bellevue Hospital.

The deaths occurring in Philadelphia during the week ending October 30th, reached a total of 349, a decrease of 57 from the preceding week, and a decrease of 13 over the corresponding week of last year. Of the whole number of deaths, 97 occurred in children under five years of age. The new cases of contagious diseases numbered 234, or 22 more than the week before. There were 5 deaths from enteric fever, with 26 new cases; 3 deaths from scarlet fever, with 54 cases; and 24 deaths from diphtheria, with 154 new cases.

THE INTERNATIONAL LEPRA CONFERENCE.

[From our Special Correspondent.]

BERLIN, October 30, 1897.

THE International Lepra Conference held its last session the morning of the 16th of October, and the members left the city thoroughly persuaded that Berlin is the place in which to hold a medical meeting. The reception accorded them on all sides has been most cordial. The Kaiser himself and the Imperial Government clearly manifested interest in the conference. The Chancellor of the Empire gave a reception to the members on Tuesday, and the Emperor and Empress received them in the "New Palace" at Potsdam on Friday. All the foreign delegates were given a personal introduction to the Emperor, who evidenced considerable information on the subject of leprosy, and showed that he is able to appreciate the work of the Conference. The new Public Health Building was placed at the disposal of the Conference, and proved eminently suited to the purpose. The feeling expressed on all sides was one of hearty appreciation of the efforts of the Berlin Dermatological Society, and especially of Professor Lassar, the chairman of the Committee on Organization.

The proceedings of the first day consisted of addresses by distinguished leprologists, introductory to the proper work of the Congress, which largely consisted of the discussion of mooted points.

Professor Besnier of Paris insisted upon the possibility of an early diagnosis of leprosy by means of a bacteriologic examination. He emphasized the importance of such a diagnosis in the protection of others from chances of infection.

Professor Hansen's address was brief, and was mainly concerned with the lack of lasting results from all forms of treatment. He denied that the disease is self-limited, though this has been strongly asserted. There are periods of latency when, though the patient is perhaps atrociously mutilated, the progress of the disease seems to have been arrested; but a cure, in the proper sense of the term, does not take place.

Professor Hutchinson, on account of indisposition, was unable to be present, and so his paper was read for him. It consisted of a reassertion of his favorite theory, that leprosy is due to the consumption of fish, especially salt fish, in certain stages of decomposition.

Professor Neisser spoke of the recent work in his clinic

at Breslau, by which it had been demonstrated that thousands of bacilli are given off from the bodies of lepers; that they are discharged in the breath, and exist in large numbers in all the secretions, and in the scrapings of the skin.

Professor Neumann of Vienna considered that the seeming spread of leprosy in certain countries during recent years is really due to the fact that atypical or abortive cases are better and more easily recognized, owing to a more accurate knowledge of the disease, and so are reported more faithfully.

Professor Petersen of St. Petersburg mentioned the spread of leprosy among the poorer classes of Russia, and considered it practically demonstrated that the spread of the disease is due to contagion, although it often requires a long time after exposure before the symptoms are manifested.

The third day was devoted to a discussion of the following questions: (1) "How Far Are We Justified in Considering the Lepra Bacillus as the Cause of the Disease?" and (2) "What Are the Ways of Inoculation?"

The reading of papers was not allowed, any one having had the opportunity to send communications before the meeting. These were placed in the hands of the members in the form of a volume of preliminary transactions. This excellent rule (eminently commendable to other medical societies) secured two noteworthy results: (1) The presence of the members at the sessions in order to follow the discussions of questions in which they were interested; (2) lively discussions replaced the dreary reading of long-winded papers, which often make medical meetings such a bore.

Practically all the authorities were agreed as to the specificity of the bacillus of Hansen. Professor Neisser has found almost invariably, in cases of anesthetic leprosy which had been examined thoroughly, that the bacilli are to be found in the nerves. As to whether the neuritis thus caused is centripetal or centrifugal, ascending or descending, is not so easy to decide. Great care is required in distinguishing anesthetic leprosy from the macular, erythematous patches of tuberculous leprosy before the surface elevation occurs. In these latter the demonstration of the bacilli is comparatively easy. As to whether the demonstration of the bacillus is necessary for assured diagnosis, authorities seem to be divided. Kaposi considered the finding of the bacillus an assistance rather than a criterion. He showed colored plates of three cases of papular leprosy in which, though he had been unable, even with the assistance of so skilled a pathologic anatomist as Professor Paltauf of Vienna, to find bacilli in excised portions of tissue, he considered the clinical characteristics sufficiently typical to justify the diagnosis. Hansen, Ehlers, and Arning, after a careful examination of the pictures, said they did not consider the cases to have been leprosy. The French leprologists seemed to be of the same opinion, and Von Dühring of Constantinople considered them very doubtful. Unna said that he thought the pictures were representations of true leprosy, and that it is in the variety of the disease illustrated that the demonstration of the bacillus is most difficult. With his new technic—*careful* discoloration in nitric acid and counterstaining with one-per-cent. orcein solution, most of the difficulties vanished. Doutrelepont insisted that in such cases a large number of sections must be examined. Generally the conclusion seemed to be that in beginning cases and in atypical abortive forms of the disease the finding of the bacilli is almost absolutely necessary to justify a diagnosis.

As to the conveyance of the infection, some startling observations were detailed in regard to the number of bacilli given off from a single leper. These communications formed the most striking addition to the present knowledge of leprosy. Sticker of Giessen had found an abundance of lepra bacilli in the nasal secretion of 140 out of 153 lepers examined. They occurred even at times when there did not seem to be any leprous lesions in the nose. Weber of Halle had found an enormous number of bacilli in scales scraped from the skin of lepers, many of which were about ready to drop off. He had found them in the saliva, in the sweat, in the tears, and in the hair.

From Neisser's clinic, Schæffer reported that he had calculated that a leper gave off 150,000 bacilli per hour. A cover-glass held before the patient while he read aloud would be covered with bacilli, and they extended to a distance of 1½ meters from the patient. The most careful antisepsis of the mucous membranes, the use of bichlorid of mercury and nitrate of silver, did not cause them to completely disappear, though it greatly lessened their number. Professor Petersen considered that an examination of the nasal secretion for bacilli often made a positive diagnosis possible at an early stage of the disease. Jeanselme considered the nasal secretion diagnostic in most cases.

The third day was devoted to the following subjects: (1) "Pathologic Anatomy and Histology of Lepra." (2) "The Rôle of Heredity in the Etiology of the Disease." (3) "Emigration and Immigration in their Relation to the Spread of the Disease."

Before the regular discussion began Professor Virchow, who acted as President of the conference, talked on "Pre-Columbian Leprosy in America." He considers that the mutilations seen in certain ornamental figures, found on what is evidently pre-Columbian pottery, point to the existence of leprosy on the American continent before the Spanish discoveries. There is no other disease which could produce the mutilations of the feet observed in the figures. The nasal mutilations point to lupus rather than to leprosy, but Professor Virchow called attention to certain faces in Professor Lassar's collection of wax models of Norwegian lepers which very closely resemble those found on the pottery.

As to the gross pathologic anatomy, Professor Glück showed some skulls which make it clear that changes in bones may be induced by leprosy, though this is usually denied. The lesions are commonly those of a rarefying osteitis, though some signs of inflammatory neoplasmic changes may also be noted.

The anatomy of anesthetic leprosy, and the existence of nodular nerve enlargements growing fewer centripetally

seem to point, in Professor Babes' (Bucharest), opinion to a neuritis ascendens, and such he considered leprous neuritis to be. Of the bacilli themselves, Professor Babes showed a number of specimens which exhibited the rosette form, the radii with clubbed ends, which is considered so characteristic of actinomycosis. He also exhibited some specimens of tubercle bacilli with the same peculiarities, and considered such appearances characteristic of all the infectious granulomata with whose causative agent we are familiar.

In discussing the place of the bacilli with regard to the cells, Babes precipitated the old controversy as to whether the bacilli are only extracellular or may also be found within the cells. Almost alone, Unna insisted that the bacilli are never intracellular. As to the specimens exhibited, in which it was claimed that the bacilli could be seen within the cells, he considered it an optical delusion, and that the cells really occupy the extracellular lymph space above the cell. The discussion became very warm, but no admissions were made on either side. Neisser insisted that it is sheer obstinacy to maintain the extracellular opinion in view of the speciments to be seen around the room. Unna said that when others had examined lepra specimens as long as he had they too would find his position easier to understand, and that in this, as in other things when he had stood almost alone, further investigation would show, he felt sure, that his opinion was correct. During the recess the specimens were examined very carefully by a number of experts, Professor Virchow being among the number, and all seemed to agree that the bacillus might be intra- as well as extracellular.

As to the Rôle of Heredity, there was practical unanimity of opinion that it counted for nothing in the spread of the disease. There was a complete reversal of the formal decision of the Royal College of Physicians of London, which just thirty years ago absolutely pronounced against the contagiousness of the disease. There were a few noncontagionists from the East. Zambaca Pacha's (Constantinople) paper, published in the preliminary transactions, insisted that heredity is the only etiologic factor in the causation of the disease, and Sachs of Beyrout supported this opinion at the Congress, but every one else opposed it. Alvarez, from Honolulu, had never seen a leper under 3½ years of age, and Dyer's (New Orleans) statistics showed that leprosy in Louisiana, instead of remaining among the French and the descendants of the Acadians, as it would have done if hereditary, had spread to immigrants, and now there are more German than French lepers in the State. As to emigration and immigration, all were agreed that these are the usual media for the spread of the disease. Hansen told of his trip to our American Northwest where lepers from Norway had gone. He had not found any leprosy which could be considered hereditary, though he had seen some cases which seemed to be due to contagion.

The fourth day the conference discussed "The Place of Leprosy among the Infectious Diseases and Its Relation to Syringomyelia, Morvan's Disease, and Ainhum," and "The Therapy, Especially the Serum-therapy, of Leprosy."

Professor Zambaca Pacha of Constantinople, in a long communication printed in the preliminary transactions of the conference, maintained that not only are syringomyelia and Morvan's disease abortive types of leprosy, but that scleroderma, sclerodactyle, Raynaud's disease, ainhum, morphia, and progressive muscular atrophy are also often of leprous origin. Very few, even those from the East where the frequency of lepra makes every trophic cutaneous change a subject of suspicion, went as far as this. Von Düring of Constantinople found under treatment at the Charité, in the out-patient department of Professor Jolly's service, two cases which had been diagnosed as syringomyelia, and he exhibited the patients before the conference. Many of the leprologists were inclined to pronounce the disease leprosy. In general, the trend of thought seemed to be that such cases should be regarded with suspicion, and the bacillus carefully searched for. The finding of the bacillus makes an immediate positive diagnosis possible, but only further observation of the course of the disease could assure a negative diagnosis.

Jeanselme's position as regards Morvan's disease was generally accepted. He had been unable to find bacilli in the original cases of Morvan's disease in Brittany after most careful search, and believed there was question of its being a nervous, trophic affection, not a contagious or hereditary disease. In general, it was considered possible, however, that sporadic cases of leprosy could be found in the midst of otherwise healthy communities where leprosy had never occurred. The cause is to be found in some contact with lepers on the part of the patient. As the contagion only reveals itself after years, physicians must be ever on their guard in suspicious cases.

As to serum-therapy, very little that was encouraging came from Europe. Carrasquilla's serum had been used in Paris, Dorpath, Berlin, and in Denmark, always without success, and in some cases with the production of dangerous symptoms. Dr. Carrasquilla attributes the non-success of his serum in Europe to some chemic change which occurs in it during the long voyage. Serums prepared according to his method here in Europe, in at least one case, seem to have given no better results. The novelty of Professor Dyer's (New Orleans) method of treatment and the promising results of the preliminary report attracted considerable attention. He uses Calmette's antivenin, the antidote for snake-bite, obtained by inoculation of the virus into animals.

Hansen, Doutrelepont, and Peterson insisted on the *rôle* of suggestion in the improvement of lepers at the beginning of a new treatment, and warned against the acceptance of therapeutic results which had not stood the test, not of months or even a year, but at least of four or five years.

As regards other therapeutic measures, Besnier considers oil of chaulmoogra almost a specific when combined with electrolysis of the tuberculous lepra patches; it has effected some striking cures in his hands. Neisser has seen iodin do good for a time, but recurrences are noted. In Unna's experience, iodin preparations have accomplished something. Both believe in cauterization of the local lesions, Neisser with nitric acid.

In Norway injections of the soluble salts of mercury is

the favorite treatment, but the symptoms recur with this as with other treatments. The general opinion seemed to be that some combination of iodin and mercury used intermittently, as for syphilis, constitutes the best treatment known.

Professor Hallopeau read a paper on leprosy in Paris. There have always been a number of lepers under treatment in Paris, and of late years this number has largely increased. There has never been a case of contagion observed, though isolation is practically *nil*, and immense numbers of lepra bacilli have been demonstrated by Jeanselme to be given off in the secretions of the lepers. He considers that in the climate of Paris the vital resistance is such that contagion is practically out of the question, and that lepers may be treated freely in hospitals in temperate climates without danger of contagion.

The last two days of the conference were taken up with the discussion of the following subjects:

(1) "The Isolation of Lepers and the Best Regulations for the Purpose." (2) "The Best Manner of Establishing Lazarrettos." (3) "The Founding of Leper (Philanthropic) Societies." (4) "The Establishment of a Permanent International Committee." (Resolution of Dr. Ashmead of New York.)

All were agreed that isolation is the ideal means to eradicate the disease. Hansen's resolution, "that isolation is the best means of preventing the spread of the disease, and that the system in vogue in Norway is recommended to all nations," was unanimously adopted.

By this system those who are sufficiently well-to-do to be able to segregrate themselves in their own houses according to law, are allowed to do so. All others must go to a lazaretto. Dr. Ashmead's resolution was considered inopportune. Professor Neisser's resolution for the appointment of a permanent committee with power to form a lepra society was adopted.

SOCIETY PROCEEDINGS.

AMERICAN PUBLIC HEALTH ASSOCIATION.

Twenty-fifth Annual Meeting, Held at Philadelphia, October 26, 27, 28, and 29, 1897.

FIRST DAY—OCTOBER 26TH.

MORNING SESSION.

THE meeting was called to order by the President, DR. HENRY B. HORLBECK of Charleston, S. C., after which a business session was held. Sixty new members were elected, and the reports of the various committees were read. A new special committee on "Demography in its Sanitary Relations" was appointed, and a resolution adopted to the effect that the supervision of city water supplies should be vested in properly constituted boards composed of sanitarians.

DR. FREDERICK MONTIZAMBERT, General Superintendent of Quarantine of the Dominion of Canada, read the report of the "Committee on Steamship and Steamboat Sanitation," in which special attention was called to the necessity of freely exposing unlaundried bedding—mattresses, pillows, and blankets—to the sun and air after each trip. Reference was also made to the danger incurred by the traveling public of contracting pulmonary tuberculosis from fellow-passengers, who, in their expectorations, scatter broadcast infectious material, and it was suggested that all steamboat saloons be supplied with proper receptacles containing a disinfection solution, and, furthermore, that expectorating upon the decks of vessels carrying passengers be strictly prohibited.

A paper, entitled

A CONTRIBUTION TO THE STUDY OF YELLOW FEVER FROM A MEDICO-GEOGRAPHICAL POINT OF VIEW

was read by DR. EDUARDO LICEAGA, President of the Supreme Board of Health of Mexico, and DR. JOSÉ RAMIREZ, Secretary of the same board. The intention of the authors evidently was to combat the idea that yellow fever is epidemic along the whole Gulf Coast, and the statement was made that at the port of Vera Cruz only three cases occurred during last summer. It was also shown that special care is taken by the Mexican Board of Health to prevent the importation of the disease from the countries of Central America, where it is endemic. The paper asserted that no source of yellow fever exists on the Pacific Coast of the Mexican Republic, and that whenever a suspicious case is reported the Board sends an expert to make a thorough investigation. In this way many supposed cases of yellow fever had been proved to be a variety of fever which assumed a typhus form, and, moreover, that no new cases of this disease have appeared since the first of October. Reference was also made to the difficulty which exists in establishing a positive diagnosis between genuine yellow fever and certain forms of paludic infections which in hot climates often assume the serious characteristics of the former disorder. The paper closed with the statement that Vera Cruz, which has not suffered from yellow fever, is now quarantining against the United States, and has at the present time in the lazaretto of Sacrificio a steamer which recently arrived there from Mobile, Ala., with three cases of the disease on board.

DR. WILLIAM BAILEY of Louisville, Ky., remarked that it is indeed a reversal of the usual order of things to have Mexico guarding against the introduction of yellow fever from the United States. He also spoke of the doubt which exists in New Orleans as to the correctness of the diagnosis in many cases on account of the low mortality (eleven per cent.) which has marked the course of the present epidemic. He said that the first case which occurred in Louisville was imported from Ocean Springs, Miss. The patient referred to displayed unmistakable symptoms of yellow fever, and the disease was diagnosticated as such by the physicians in attendance. He was removed from his hotel to a private sanatorium where he died, and was quietly buried without alarming the people. Notice was at once sent to the health authorities of New Orleans, and they were advised to investigate the disease at Ocean Springs. Subsequently, Dr. Oliver and his staff went from New Orleans to the former place and decided that the disease was not yellow fever in spite of the very positive diagnosis which had been made in Louisville.

Later new cases developed at Ocean Springs, and the true nature of the disease was recognized. Meanwhile precious time had been lost, and the disease had been scattered in all directions.

DR. SAMUEL H. DURGIN of Boston said that the lesson to be learned from the present epidemic is the importance of studying all suspicious cases coming from the Gulf Coast, and added that the United States Government could save money in no better way than by assisting the medical profession to discover a means by which a correct diagnosis of yellow fever may be made.

DR. P. H. BAILBACHE of Stapleton, Staten Island, N. Y., remarked that if Sanarelli's investigations are correct, a basis has been formed upon which a correct diagnosis may be made.

DR. BAILEY expressed the opinion that the bacillus for whose discovery Saranelli is receiving the credit is in reality the identical one which was isolated by Dr. Sternberg, and that too much could not be said in praise of the latter's work in this line.

As the topic is one of so much general interest it was decided to devote more time to its discussion than the morning session allowed, and it was made the special order of business for Friday afternoon when it was expected that Dr. Sternberg would be present. After the adjournment of the morning session many of the members visited an exhibition of disinfecting-agents which was held in Horticultural Hall. The principal feature of this exhibition was the new disinfectant formaldehyde, which is claimed to be more penetrating and more powerful than corrosive sublimate, or any other antiseptic. Six generators were shown which will produce the formaldehyde gas either from a solution or from the drug in solid form. A number of disinfectants and disinfecting-machines were on exhibition, and the Boards of Health of all the large cities of the country were represented by apparatus showing the methods of disinfection employed by each.

The evening session was devoted to the President's annual address.

SECOND DAY—OCTOBER 27TH.

MORNING SESSION.

A resolution was adopted authorizing the appointment of a committee of five to carry out the recommendations made by the President in his address, with reference to the investigation of the causes of yellow fever.

The report of the Committee on Pollution of Water-supplies was then read by Assistant Surgeon-General CHARLES SMART, U. S. A., of Washington, D. C., who said that the work of the committee had chiefly been in the direction of perfecting methods of bacteriologic research. He referred to the difficulty of securing a sufficient number of men to do the work, for the reason that the students of bacteriology in America are so busy keeping up with the advances of this branch of science that they have no time to devote to the work of the committee. Furthermore, he asked that the committee be discharged from its duties and a new committee appointed which shall consist of two men who are familiar with municipal water-supplies, two who have a knowledge of the chemic aspect of the subject, and two who are well versed in its bacteriology.

The report of the Committee on Disinfectants was then read by DR. FRANKLIN C. ROBINSON of Brunswick, Me. The report spoke most highly of formaldehyde as a disinfectant, and referred to the fact that only a year ago it was practically unknown in this country, while now it is in general use. He expressed the opinion that there is still much to be learned about this agent, and predicted that as great and even greater progress would be noted in the coming year as had been seen in the one just past.

DR. FRANK W. WRIGHT of New Haven, Conn., then read a paper, entitled

DIAGNOSIS OF SMALLPOX.

The author emphasized the great importance of making an early diagnosis, which next to vaccination is the most essential factor in preventing the spread of the disease. This is not always easy, because in these days of general vaccination, a typical case of smallpox is rarely seen, the vast majority of these cases being modified by former vaccina are really cases of varioloid; in other words, modified smallpox. This modification, unfortunately, is not uniform in all cases and the responsibility of making an official diagnosis is very great, and is felt by all health officers. As many practitioners of medicine have never seen a case of smallpox, and few have seen a sufficient number to be familiar with the appearance of the disease, whenever a physician sees a patient with a suspicious eruption he immediately informs the health authorities, upon whom he shifts the responsibility of making the diagnosis. The health officer is thus placed in a very trying position; to err on either side is fatal to future success. If he fails to recognize a case of smallpox and the disease is spread, he is subjected to most severe criticism, and most likely loses his position. While, on the other hand, if he should be unfortunate enough to pronounce as smallpox some disease which resembles the modified form of that disorder, he is just as severely criticized, and may have to defend himself in a suit for damages.

AFTERNOON SESSION.

DR. A. WALTER SUITER of Herkimer, N. Y., read a paper, entitled

THE BARBER-SHOP AS A MENACE TO THE PUBLIC HEALTH.

The author said that the time has now arrived when the attention of the Association and, through it, that of the public health authorities in general should be called to that part of hygiene which applies to the barber-shop. That this common mode of infection should have for so long a time escaped attention in these days of asepsis and antisepsis, may be noted as one of the most contradictory circumstances of a time in which the sanitary relations of most, if not all, public occupations are carefully investigated and restricted. The first attempt of modern times to sanitarily regulate the barber-shop was made only recently in Paris, where an order was issued requiring that specific rules of asepsis and disinfection shall be observed. Only combs of metal, which can be sterilized, are per-

mitted, and all other instruments, as far as possible, must be of metal. These must be subjected to a temperature of 100° C.—212° F.—before and after use. Shaving brushes must be washed before and after use in boiling water, and the hands of the barbers thoroughly cleansed before passing from one patron to another. Sterilized towels are also to be used, pulverizers are to replace the powder puffs, and hair which is removed is to be immediately disinfected and taken out of the shop.

DR. LEONARD PEARSON of the Veterinary Department of the University of Pennsylvania, then read a paper on

METHODS OF MEAT INSPECTION.

In many of the countries of Europe during the last century laws were passed to provide for the inspection of meat, but it is only within recent years, since the bacterial origin of many diseases has been demonstrated, and the relation existing between many of the diseases of man and animals has been established, that the importance of rational meat inspection has been recognized. At the present time all the countries of Continental Europe and the British Isles have a system of meat inspection, which, although incomplete in some places and in some details, is sufficient to protect the consumer from the numerous maladies which may be contracted by eating the flesh of diseased animals. The system which has proven most satisfactory in Europe includes the establishment of a municipal abattoir under the direction of a veterinarian trained in meat inspection, and provides that all animals shall be slaughtered in this establishment. These animals are examined while living and after they are killed. Both inspections are necessary because certain conditions, such as fever, fatigue, exhaustion. starvation, and excitement, which would have an effect upon the meat can only be detected during life. After the animal is slaughtered its organs are examined for evidences of diseases which are directly transmissible to the consumer, parasites which may be injurious, and other conditions which render the meat indigestible or toxic. Germany has more than six hundred of these municipal slaughter-houses, the facilities of which the butchers enjoy by paying a reasonable rental.

The author said that in some American cities, meat inspection is carried out upon good principles; in many, however, of which Philadelphia is one, the inspection of meat is based upon entirely different lines. The meat trade is governed by laws which forbids the sale of any meat which is diseased or unwholesome, it being assumed that the butcher is capable of determining this point. Detectives and police officers are appointed to visit the slaughter-houses, markets, and butcher-shops, to look for diseased meat. If any is found, a veterinary officer is called in to condemn it. This system is complicated and objectionable; if the supervision were properly carried out it would require as many inspectors as there are slaughter-houses. A large municipal establishment, with the cooperation of the butchers, can be conducted on a paying basis; for the rentals received from the butchers cover the running expenses. It is also an advantage to the butcher for it costs him less than it would to have his own slaughter-house.

DR. EDWARD JACKSON of Philadelphia then read a paper, entitled

EYE-STRAIN FROM POOR WINDOW-GLASS.

The author referred to the eye-strain caused by astigmatism and the resulting headache and nervous symptoms, and pointing out that the same effect may be produced in normal eyes by defective window-glass. Glass in which there are irregularities of thickness acts like a lens, and its bad influence is intensified by the eye having to look through different parts thus causing different degrees of strain and making it impossible for the eye to properly adjust itself. Even comparatively slight defeats in glass will cause eye-strain similar to that of astigmatism. The use of plate-glass which is entirely free from these defects should be required. This is one of the few luxuries whose effects are entirely beneficial instead of being harmful. Its use in all public conveyances is especially to be desired, as defective window-glass is one of the principal causes of "car-sickness" from which so many people suffer.

REVIEWS.

THE SEQUELS OF DISEASE, BEING THE LUMLEIAN LECTURES (1896), TOGETHER WITH OBSERVATIONS ON PROGNOSIS IN DISEASE. By SIR DYCE DUCKWORTH, M.D., LL.D., Fellow and Treasurer of the Royal College of Physicians; Physician and Lecturer on Medicine, St. Bartholomew's Hospital. London, New York, and Bombay: Longmans, Green & Co., 1896.

THE eminent clinician, the author of these essays, rich in observation and study, begins with a consideration of the sequels of the "Specific Contagious Diseases," and points out that, paradoxical as it may appear, persons rarely die of the disease from which they suffer. Considering these diseases then, he tells in the choicest of words the well-known after-results of the infectious and contagious diseases. He mentions three forms of sequelæ which may follow influenza, the thoracic, the gastro-intestinal, and the nervous. Almost an entire lecture is occupied by a consideration of the effects of syphilis. The volume closes with a most readable chapter on "Prognosis in Disease," in which the author dwells upon the desirability and necessity of cultivating the art of prophecy in the treatment of diseases.

The work is charmingly written, abounds in evidence of scholarship and learning, and is a valuable addition, in every sense, to medical literature. A copious index is appended to the book, which is very handsomely printed on heavy paper.

A COURSE OF PRACTICAL HISTOLOGY. By EDWARD ALBERT SCHAFER, LL.D., F.R.S., Jodrell Professor of Physiology in University College, London. Second edition. Philadelphia and New York: Lea Brothers & Co., 1897.

THIS book fulfills its aim. The author tells us in his preface that it is his intention neither to give an exhaustive

account of all modern histologic methods, nor to describe in detail the appearance of histologic specimens. He aims rather to furnish the student the means of conducting histologic research without the constant presence of a teacher. In carrying out this line of thought, he has recorded in simple, admirable English, the recognized methods of fixing, staining, cutting, and mounting. Although some of the methods emoloyed in special research are not found here, the work contains all that a student or a general practitioner can desire in the way of histologic technic. The histologic elements of the human body are taken up in order, beginning with the blood, considering next the visceral and peripheral organs and their ultimate divisions and ending with the organs of special sense. A clear and concise introduction deals with instruments and general histologic methods.

We know of few books which compare with this for thorough usefulness. The former edition has long been a laboratory favorite, and we hope that the present one will soon be exhausted. The book is handsomely printed and profusely illustrated.

INJURIES AND DISEASES OF THE EAR, BEING REPRINTS OF PAPERS ON OTOLOGY. By MACLEOD YEARSLEY, F.R.C.S., Fellow of the British Laryngological, Rhinological, and Otological Associations; Surgeon in Charge of the Department for Diseases of the Throat, Nose, and Ear at the Farringdon Dispensary. London: The Rebman Publishing Co., Limited, 1897.

THIS little collection of reprints contains a number of interesting papers on special subjects of otology, ranging from "An Artificial Membrana Tympani" and "The Use of the Pneumatic Aural Speculum," to the "Care of the Ear in Children" and "Aural Reflexes." The first-mentioned paper, treating of the improvement of hearing by the support of an "artificial drum" in cases of old, nonpurulent catarrh with a lax membrane, deals attractively with the history of this subject.

The chapter on "Foreign Bodies in the Ear and Their Treatment," and that advising "What Not to Do in Diseases of the Ear," are of value from a practical standpoint, and while they contain nothing original, sum up in a concise and lucid way the precepts best worth following. The volume, which appears in attractive guise, is marred by inferior presswork, blurred print, and inadequate spacing being particularly noticeable.

THE MIDDLESEX HOSPITAL, W. Reports of the Medical, Surgical, and Pathological Registrars for the Year 1895. London: H. K. Lewis, 1896.

THE Middlesex Hospital reports are well-known for their scientific value. The present volume is no exception. It embraces, aside from necessary statistics, special articles on exceptional and interesting cases, and a full reference to fatal issues of disease. The report of the pathologist is scientific, interesting, and complete. It is a pity that this example cannot be imitated in this country, so that instead of learning annually how many cakes of soap or flat-irons Mrs. X. has presented, we might learn something of what our hospitals are actually accomplishing in the treatment and cure of disease.

SURGICAL HINTS FOR THE SURGEON AND GENERAL PRACTITIONER. By HOWARD LILIENTHAL, M.D., Assistant Attending Surgeon to Mt. Sinai Hospital, New York City. New York: International Journal of Surgery Co., 1897.

THE author of this book has compressed into a few pages facts and suggestions which only the experience of years can teach. It is a work which can be perused with profit by those who perform minor, as well as major surgical operations. It is concise, capitally written, and full of valuable suggestions. Dr. Lilienthal has done the profession a service by giving it the results of his experience in such attractive style.

THERAPEUTIC HINTS.

Iceland Moss as an Anti-emetic.—For this purpose the dose is *m.* x to ʒ i of the tincture, three times daily before meals. It is chiefly recommended for the persistent vomiting which occurs in uremia, polyneuritis, chlorosis, the dyspepsias, cancer of the stomach, and during the gastric crisis of tabes. It is believed that it will prove useful in the vomiting of pregnancy.

For Chlorosis the following combination is highly recommended:

℞ Tinct. ferri. perchlor. . . . ʒ ii
Spts. ætheris sulph. . . . . ʒ ii
Tinct. nucis vom. . . . . ʒ ii
Tinct. quassiæ . . . . ʒ vi.

M. Sig. A teaspoonful in half a glass of water, twice daily, before meals.

For Subinvolution of the Uterus.—

℞ Strychninæ sulphatis . . . gr. ½
Quininæ sulphatis . . . gr. xx
Ext. ergotæ . . . . gr. x.

M. et. ft. pil. No. x. Sig. One pill three times daily.

For Uremia.—

℞ Ext. pilocarpi alc.
Ext. scillæ
Res. jalapæ
Res. scammonii
} aa . . . gr. xv.

M. et. ft. pil. No. xx. Sig. Four or five pills daily during as many days.

For Simple Tonsillitis.—

℞ Creolin . . . . . gr. xv
Aquæ destillatæ . . . . ʒ i
Aquæ menth. pip. . . . ʒ iii.

M. Sig. Use as a gargle.

For Tineasycosis.—

℞ Napthol . . . . . ʒ i
Saponis viridis
Cretæ præp.
Sulphuris loti
Lanolini
} aa . . . . ʒ vi.

M. Sig. Apply locally at bed-time.

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AFTER THE GRIP, WHAT?

Few diseases are marked by such tedious and unsatisfactory convalescence as is the one known as epidemic influenza. After the acute symptoms have passed away, extreme weakness and prostation remain, persisting for a long time in spite of the ordinary modes of treatment. The patient is left in a condition of general debility altogether disproportionate to the apparent gravity of the affection. Vague neuralgias and mental hallucinations occur, together with an unaccustomed liability to contract other diseases with very slight exposure, or to suffer relapses of this disease. If the patient be a brain-worker he finds it especially difficult to apply himself to his usual tasks. Either physical or mental exertion is followed by profound exhaustion.

Let us now look into the actual condition present, and then we can more intelligently seek an appropriate remedy—not merely a temporary palliative.

The patient has just passed through a serious and violent disease which, although of comparatively brief duration, has profoundly affected the great nerve centers, and from which they naturally can recover but slowly. Through excessive weakness of the nervous supply of the vital organs, their functions are but feebly and imperfectly carried on. How many there are who date the beginning of a permanent state of decline to their attack of La Grippe.

The ordinary tonics—iron, quinine, strychnine, &c.—seem utterly unable to cope with this condition. In fact, it is not stimulation that the patient needs, as by it he is only led to overtask his strength, and finally finds himself completely broken down. He needs a reconstruction of the worn-out tissues.

The remedy which will be effective, then, must be one that will convey to the tissues the revivifying and vitalizing agent, phosphorus, in its oxidizable and assimilable form. Thus the true vitality of the nerve structure is restored, and with it the healthy function is re-established. The process is not that of stimulation, or whipping up the exhausted powers, but is one of renewing the nutrition of the tissues themselves; hence, it is steady and sure in its progress and permanent in its results. The patient feels that he is gradually recovering his accustomed strength of mind and body.

The one form in which the compounds of phosphorus, as they exist in normal animal cells, can be conveyed to the tissues and there utilized is in the oxidizable form of the hypophosphites of lime and soda, chemically pure. It should be given early, and continued, at appropriate intervals, until the condition has been entirely overcome. Its favorable action in convalescence from acute diseases in general is especially marked in the disease under consideration. By its use many cases of chronic invalidism can be averted, and the susceptibility to intercurrent diseases corrected.

As it is essential to have the agent in an absolutely chemically pure form, McArthur's syrup should be prescribed. This is an agreeable, wholesome syrup, containing only the pure hypophosphites of lime and soda. If you are not already acquainted with it, a full-sized bottle will be sent you, if you will agree to pay express charges. Address, The McArthur Hypophosphite Company, Boston, Mass.

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ORIGINAL ARTICLES.

RECENT RESEARCHES RELATING TO THE ETIOLOGY AND SPECIFIC TREATMENT OF YELLOW FEVER.[1]

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IN a paper read at the Twelfth International Medical Congress at Moscow during August of the present year, and published in the September number of *The American Journal of the Medical Sciences*, I have given my reasons for believing that the bacillus icteroides of Sanarelli, and a bacillus obtained by me from yellow-fever cadavers at Havana, provisionally named "bacillus *x*," are identical. If the identity is not established, the claim of Sanarelli that his bacillus icteroides is the specific infectious agent in yellow fever cannot, in my opinion, be admitted. For this specific infectious agent must be the same in yellow fever occurring at Havana as for that occurring at Rio de Janeiro. My extended and painstaking bacteriologic researches in a series of forty fatal cases occurring in the city of Havana during 1888 and 1889, and three occurring in Decatur, Ala., during the epidemic of 1888, show that no micro-organism, other than my bacillus *x*, develops in the culture media usually employed by bacteriologists, except the colon bacillus and a few other species exceptionally found and excluded from consideration for reasons stated in my report on "The Etiology and Prevention of Yellow Fever," published during 1890. In summing up the results of my investigations I refer to the bacillus *x* as follows:

"Among the facultative anaerobics is one—bacillus *x*—which has been isolated by the culture method in a considerable number of cases of yellow fever, and may have been present in all. This bacillus has not been encountered in the comparative experiments made. It is very pathogenic for rabbits when injected into the abdominal cavity. It is possible that this bacillus is concerned in the etiology of yellow fever, but no satisfactory evidence that such is the case has been obtained by experiments upon the lower animals, and it has not been found in such numbers as to warrant the inference that it is the specific infectious agent. All other micro-organisms obtained in pure cultures from yellow-fever cadavers appear to be excluded, either by having been identified with known species, or by having been found in comparative researches made outside of the area of yellow-fever prevalence, or by the fact that they have been found only in small numbers and in a limited number of cases."

The bacillus of Sanarelli readily grows in the culture-media which I employed in my researches, and if present in the blood or tissues of the yellow-fever cadavers examined by me at Havana, I could not have failed to find it. In stating conclusions in my official report I say: "The specific infectious agent in yellow fever has not been demonstrated." It will be observed that I say "has not been *demonstrated*." I do not say that it has not been discovered, for I suspected at that time that my bacillus *x* was possibly the specific yellow-fever germ.

The name of Eberth is commonly associated with the typhoid bacillus, but Eberth was only successful in finding this bacillus in the lymphatic glands or in the spleen in eighteen out of forty cases in which he searched for it, and it was not until four years later (1884) that Gaffky obtained it from the spleen of typhoid cadavers in twenty-six out of twenty-eight cases examined by him. The demonstration that this is the specific infectious agent of typhoid fever was evidently not made by Eberth, but depends upon the researches of Gaffky, Fränkel, Simmonds, and other more recent investigators.

Klebs is supposed to have first observed or discovered the diphtheria bacillus, but Löffler demonstrated it to be the specific infectious agent in this disease, and this bacillus is spoken of as the Klebs-Löffler bacillus.

Continental bacteriologists have not been so particular in recognizing the discoverer of the micrococcus of pneumonia, which was isolated and described by me in 1880, and was observed in pneumonic sputa by Talamon in 1883, by Salvioli during 1884, and by the author in 1885, before the publication of Fränkel's first paper detailing the results of his investigations. As a matter of fact, the demonstration that this micrococcus is concerned in the etiology of pneumonia depends upon the investigations of Talamon, Salvioli, Sternberg, Fränkel, Weichselbaum, Gameleia, and others, and the common practice of referring to it as Fränkel's pneumococcus is an injustice to the discoverer, and to others who have had a share in demonstrating its rôle in the etiology of croupous pneumonia.

[1] Read at the Annual Meeting of the American Public Health Association, Held at Philadelphia, October 28, 1897.

Neisser discovered the gonococcus, and named it, but he did not present any satisfactory experimental evidence that it is the specific germ of gonorrhea. This demonstration was made by Bumm and others. However, Neisser's name, alone, is usually mentioned in connection with this germ.

If my bacillus *x* and the bacillus icteroides of Sanarelli are proved to be identical by the experiments of Sanarelli and this bacillus is demonstrated to be the cause of yellow fever, Sanarelli will deserve full credit for the demonstration, and I shall not be disposed to detract in the least from the praise due him for the success achieved as a result of his investigations. If, as he claims, he has obtained the final proof that this is the yellow-fever germ by producing the disease in man (five cases), as a result of the subcutaneous or intravenous injection of filtered cultures, I think we must accept these results as demonstrating the specific character of the bacillus in question. But without this final proof the demonstration would not be satisfactory, notwithstanding the pathogenic virulence of the bacillus when injected into several species of the lower animals. If it were constantly found in the blood and tissues of yellow-fever cadavers there would be little reason to doubt its specific character. But both my researches and those of Sanarelli show that, notwithstanding the most painstaking investigations, this bacillus has not been found in a considerable proportion of the typical fatal cases of yellow fever examined.

Sanarelli says: "According to the results of my researches, the isolation of the microbes of yellow fever is only possible in 58 per cent. of the cases;" and his paper, published in the *Annales de l'Institut. Pasteur*, shows that his investigations were limited to eleven fatal cases. After having differentiated bacillus *x* from the colon bacillus, which it greatly resembles, I obtained it in about one-half of the cases studied by me in Havana during 1889. Sanarelli says, with reference to his failure to find his bacillus in a considerable proportion of the typical cases: "Its isolation often presents almost insuperable difficulties, due in part to the constant occurrence of secondary infections, and in part to its relative scarcity in the organism."

In the series of cases studied by me secondary infections were extremely rare. The colon bacillus was found in a considerable number of cases, but usually in comparatively small numbers, and there is no good reason for believing that the fatal result depended upon its presence. But for the fact that in the second case studied by Sanarelli, his bacillus was present in considerable numbers in blood extracted from the finger of the patient the evening before his death, and also, after death, in the blood, spleen, liver, and other organs, it is quite probable that his attention would not have been attracted to this particular bacillus. In this regard this case is unique, both in the series of cases investigated by Sanarelli and in those studied by me; and if this is indeed the bacillus of yellow fever, it is evident that it is usually present in the blood or tissues of yellow-fever patients in very small numbers, or not at all.

In my report I suggest the possibility that the yellow-fever germ may multiply in the intestine, as is the case with cholera, and I say: "Finally we remark that many facts relating to the origin and extension of yellow-fever epidemics give support to the inference that the specific infectious agent is present in the dejecta of those suffering from the disease, and that accumulations of fecal matter and of other organic material of animal origin furnish a suitable nidus for the development of the "germ" when climatic conditions are favorable for its growth.

"There is no evidence that yellow fever is propagated by contamination of the supply of drinking-water, as frequently, and probably usually, occurs in the case of typhoid fever and cholera. Moreover, epidemics extend in a more deliberate manner and are restricted within a more definite area than is the case with cholera and typhoid fever. It is usually at least ten days or two weeks after the arrival of a vessel with the disease on board, before cases of local origin occur; and these cases occur in the immediate vicinity of the imported case or vessel carrying the contagion. When the disease has effected a lodgment, the area of infection extends slowly and usually has well-defined boundaries. In towns and cities having a common water-supply one portion remains healthy, while another, usually the most filthy, may be decimated by the scourge."

This hypothesis led me to make the following recommendation: "The experimental evidence recorded and the facts just stated seem to justify the the recommendation that the dejecta of yellow-fever patients should be regarded as infectious material, and that such material should never be thrown into the privy-vaults or upon the soil until it has been disinfected."

Sanarelli reports his failure to find his bacillus icteroides in the contents of the intestine; but all bacteriologists will recognize the fact that the demonstration of a non-liquefying bacillus which resembles, both in its morphology and in its colonies, the colon bacillus, and which is present in comparatively small numbers in the contents of the intestines, might easily be overlooked even by one skilled in bacteriologic technic, and I cannot admit that Sanarelli's failure to find the bacillus in the contents of the in-